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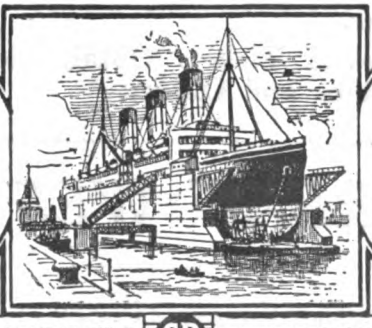

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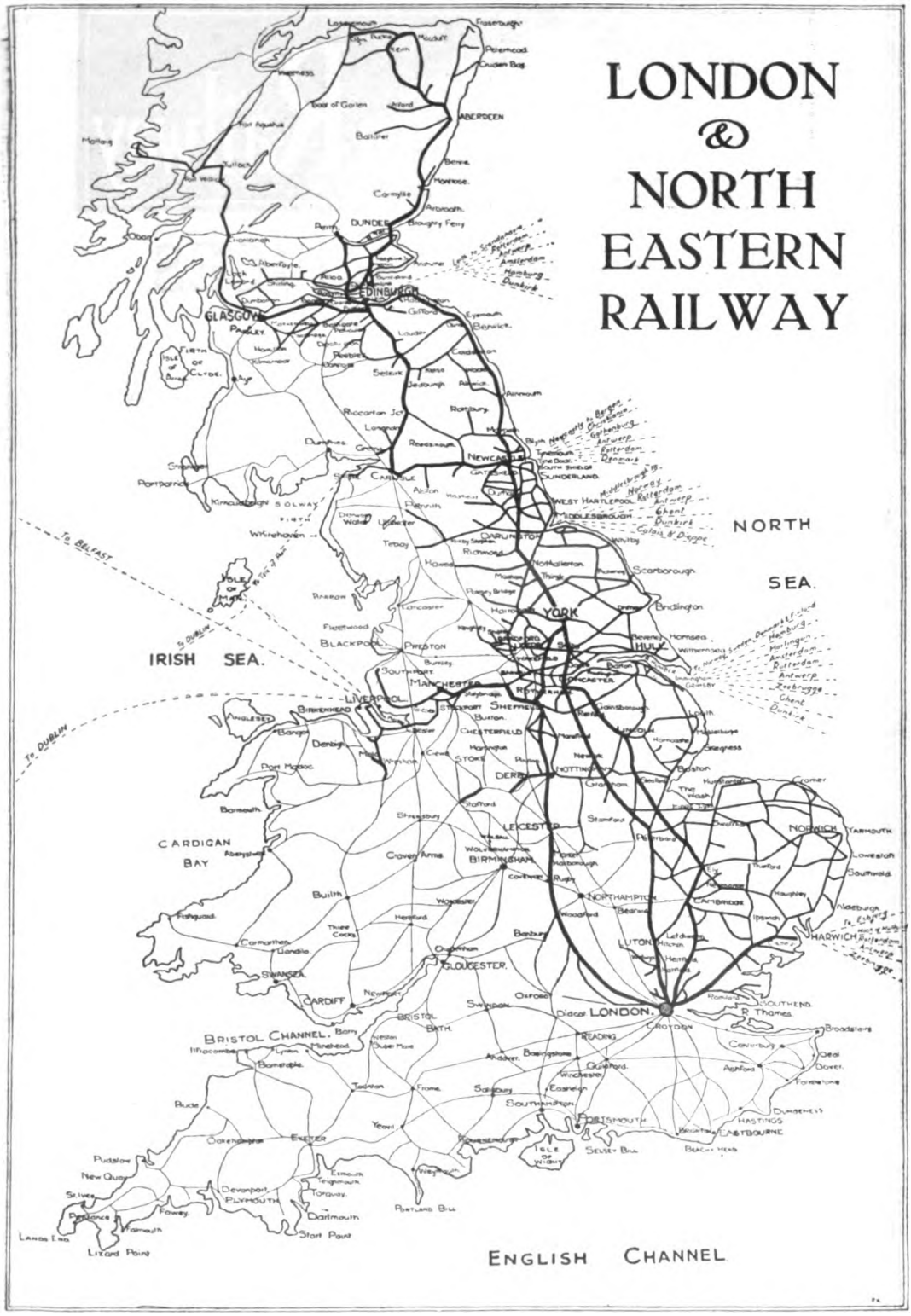

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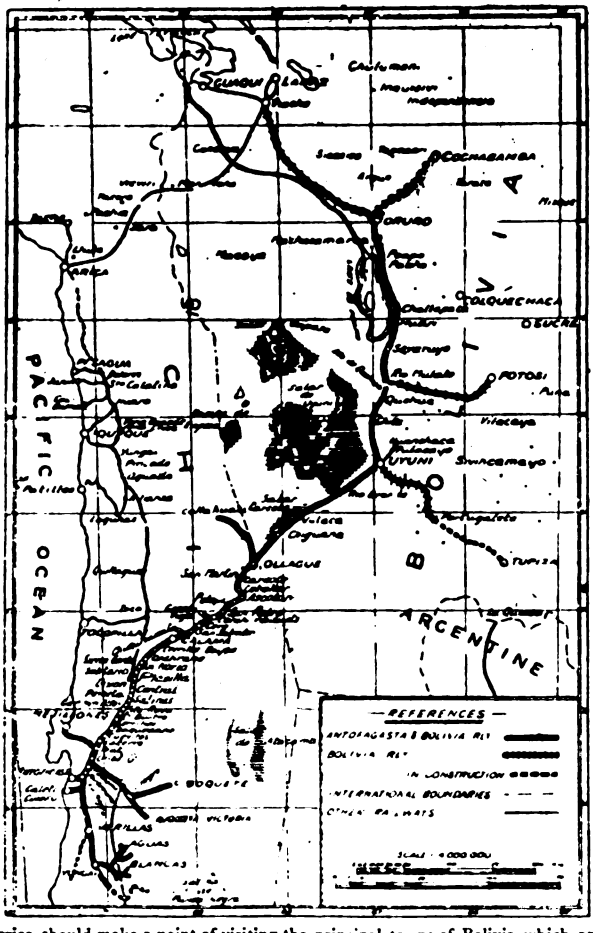

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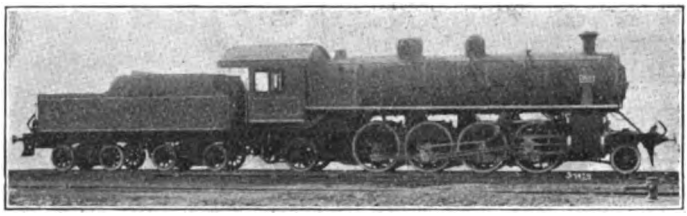

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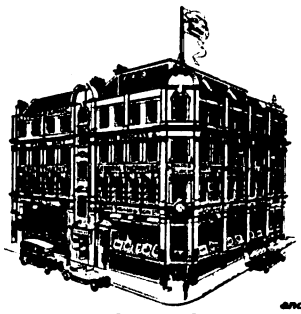

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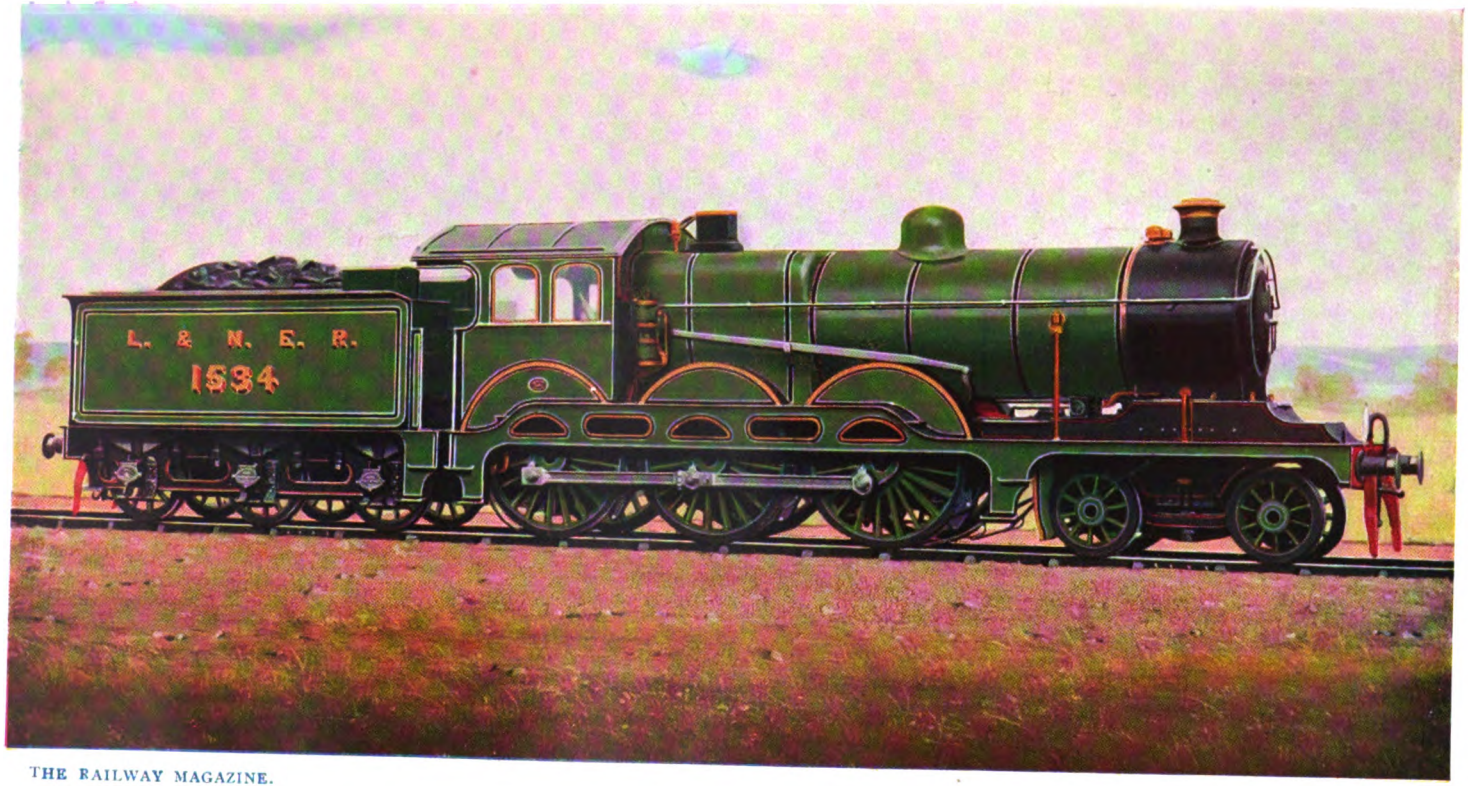

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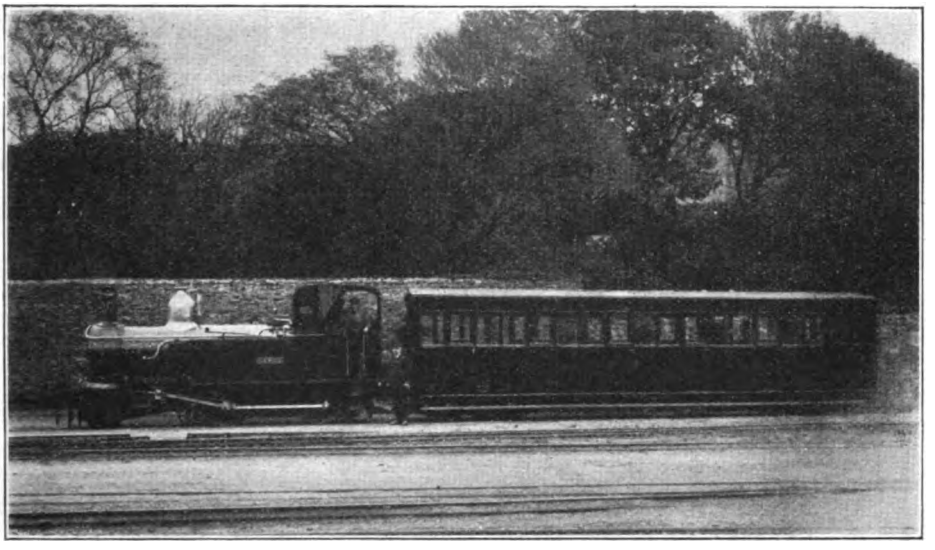

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Jubilee of the Isle of Man Railway.

FIFTY years ago, on July 1, 1873, the Douglas to Peel branch of the Isle of Man Railway was formally opened for traffic, followed 13 months afterwards, by the opening of the Douglas to Port Erin line. These events are worthy of an extended record from the fact that few undertakings in the world have assisted so greatly in the development of a locality as has been the case with regard to the lines provided by the Isle of Man Railway.

In the year 1873, the little island in the Irish Sea was just beginning to develop into a tourist resort; but, thanks mainly to the Isle of Man Steam Packet Company and the Isle of Man Railway, the island has now become one of the most popular, if not the most popular of watering places in the British Isles. Situated as it is within easy reach of England, Scotland, Ireland and Wales, the furthest of these being less than a hundred miles away, the island was bound, in course of time, to become the playground and health resort of the surrounding populations, while nature has generously endowed the island with every qualification for such a beneficent purpose. In its space of under 250 square miles it possesses mountains, glens, hills and dales of unsurpassed beauty, and is fully entitled to its popular title as the "Gem of the Irish Sea."

Up to 1873, however, it lacked one great thing. It had no railway transport, and the increasing number of tourists thronging its rocky shores had either to walk or to patronise the horse vehicles, prominent among these vehicles being at the time the old-fashioned Irish jaunting car.

Naturally the enterprising men of that day contemplated the removal of this feature of the island's disability. Meetings were held here and there to consider ways and means to bring about the construction of a railway. These various efforts proved abortive until April 21, 1870, when a dozen well-known local gentlemen met in St. James's Hall, Douglas, and after prolonged consideration decided to form a company whose object should be to construct railways connecting the four towns of the island, Douglas, Ramsey, Peel and Castletown, with an extension from the last-named town to the rising villages of Port St. Mary and Port Erin. These gentlemen were confronted with many difficulties, but, nothing daunted, they persisted in

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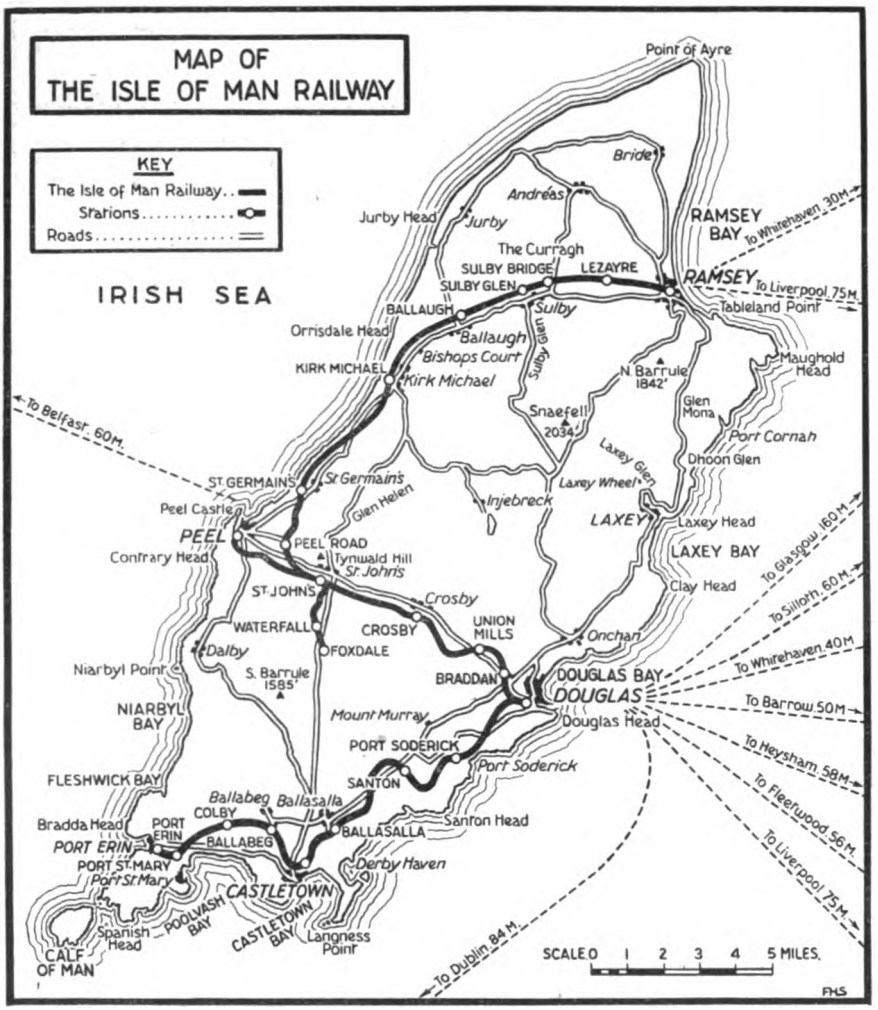
their enterprise, and ultimately success crowned their efforts, and thus they earned the everlasting gratitude of the islanders.

Sad to relate, all these clever and enterprising men, except one, have "gone west." Mr. G. H. Wood, who subsequently became Secretary and then Manager of the company, although in his 89th year, is still a director, and as such takes an active part in the direction of the company. He has justly earned his popular distinction as the "Father of the Manx Railway System."

We shall now proceed to give a few details as to the progress achieved in their undertaking by the dozen gentlemen we have referred to. On December 19, 1870, some eight months after the historic meeting in St. James's Hall, the Isle of Man Railway Co., Ltd., was registered in the Isle of Man, with Mr. H. Vignoles, M.Inst.C.E., as engineer. On the 3rd of the following month (January, 1871), Mr. G. H. Wood was appointed Provisional Secretary. On June 14 of the same year the first general meeting was held, and on July 1 Major Taubman was appointed the first Chairman of the Board.



MAP OF ISLE OF MAN RAILWAYS.

The next year (1872) was big with the

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fate of the company. The financial condition was strained. The local people did not support the undertaking as they ought to have done, and it became very doubtful if the company would be able to adhere to the original intention of constructing all the three projected lines linking up the four island towns, and at an extraordinary meeting held on January 16, 1872, it was decided to abandon the line to Ramsey as the least promising part of the undertaking and confine the operations of the company to the construction of the other two lines, that from Douglas to Peel, and that to Castletown, with extensions to Port St. Mary and Port Erin.

On May 21, 1872, Sir John Pender, M.P., a leading man in the railway world of that day, responded favourably to an invitation to join the Board, and there can be no doubt that this was an accession of strength to the company, financially and otherwise. On the very day that Sir John Pender joined the Board a contract for the construction of the Peel and Port Erin lines was signed, with Messrs. Watson and Smith, contractors, London, and with a view to facilitating the construction of the lines, a General Purposes Committee was appointed. Mr. G. H. Wood was advanced from the position of Provisional Secretary to that of General Secretary, and Mr. W. S. Mackenzie was appointed General Superintendent. Then on July 1, 1873, the Peel line was formally opened, amidst considerable rejoicings, and on the following day public traffic was commenced. On January 22, 1874, Mr. F. H. Trevithick, a member of the famous family of engineers hailing from Cornwall, followed Mr. Mackenzie as General Superintendent, and on August 2 in the following year the second of the projected lines was opened for traffic, from Douglas to Castletown, Port St. Mary and Port Erin.

On March 17, 1876, Mr. Wood was advanced to the position of Manager as well as Secretary, and he continued to occupy the joint position with satisfaction to the company and to the general public of the island until his well-earned retirement in 1903, since which time he has continued his services to the company as a member of the Board. He was succeeded as Secretary and Manager by Mr. T. Stowell, who held the position of accountant until his appointment as Secretary and Manager. Mr. Stowell is an old servant, his service dating back to October 20, 1874, just about four years after the registration of the company. In 1903 Mr. Stowell was succeeded as accountant by Mr. T. C. Hinds, another old employee. Mr. Hinds also holds the office of audit accountant.

Mr. H. Greenbank, M.Inst.C.E., was appointed Engineer in 1878, and remained in that position until his death in February, 1922. Mr. H. R. Hunt was, on May 1, 1876, appointed Locomotive, Carriage and Wagon Superintendent, and occupied that position until February, 1886, when he was succeeded by Mr. J. Sproat.

At the beginning of 1904 an important change took place in the status of the undertaking. As previously stated, at an extraordinary meeting of the shareholders on January 16, 1872, it was decided to abandon the idea of constructing the Ramsey line. This step created considerable resentment amongst a number of the inhabitants. Ramsey is the second largest town in the island. It is the centre of a large agricultural district, and it was considered a hardship that Ramsey and the surrounding district should be cut off from Douglas, the largest town on the island and the best local market for the sale of agricultural produce.

This feeling of resentment caused the formation of a separate and independent company for the construction of the Ramsey line. In due course the new company succeeded in building the line, which extends from the St. John's station of the Isle of Man Railway, to Ramsey, a distance of about 16½ miles. This company, known as the "Manx Northern," was never a profitable concern, and, on February 26, 1904, the Ramsey line, and also a small branch leading from St. John's to the mining village of Foxdale, passed into the hands of the larger and more wealthy company. On May 24 the local legislature passed an Act authorising and sanctioning the purchase, and on April 19, 1905, the Manx Northern and Foxdale lines were finally absorbed by the Isle of Man Railway Company.

Mr. J. McMillan, who had been Manager of the Manx Northern and Foxdale lines,

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DOUGLAS STATION.

was appointed Traffic Superintendent of the combined system, but that office lapsed on Mr. McMillan's death in February, 1917, and Mr. Hogg, an old servant of the company, was appointed Chief Traffic Inspector. Mr. J. Bradshaw became Locomotive and Carriage and Wagon Superintendent on April 17, 1912. On February 6, 1918, Mr. H. N. Allott, M.Inst.C.E., of Manchester, was appointed Engineer, acting along with Mr. Greenbank until the death of that gentleman. Since then Mr. Allott has been sole Engineer.

Having completed the historical portion of our task we must now devote the balance of our space to some details of the personnel of the company and to some particulars as to the capital and rolling-stock and other details of the undertaking. First as to the authorised capital. At the meeting held in April, 1870, it was decided that the share capital should be £200,000 in £5 shares, but, owing to the abandonment of the Ramsey line in January, 1872, the share capital was reduced by £80,000, being then increased by £40,000 to £160,000, an Act of the Manx Legislature, passed in 1872, limiting the share capital to £200,000. In the same year the capital was further increased to £200,000 by the issue of £40,000 in debentures. Two years later—in 1874—the capital was, under further legislative authority, increased by the issue of £26,660 13*s.* 4*d.* in debentures, and in the same year £50,000 in preference shares were created. No further change was found necessary until 1887, when the borrowing powers of the company were increased from one-third to one-half of the share capital issued, and in 1904 the capital was increased by £80,000 in debenture stock. These changes in the capital were the consequence of the extensions in the company in the purchase of the Manx Northern and Foxdale lines, and the cost of additional rolling-stock and improvement to the stations, new stations having been erected at Douglas, Castletown, Port St. Mary, Port Erin, and Peel.

The capital of the company is now £380,000—made up of £150,000 in ordinary shares, £50,000 in preference shares and £180,000 in debenture stock. The unissued capital is £10,000 in ordinary shares and £14,690 in debenture stock.

The original directors when the company was formed in 1871 were :—James Gell (Attorney-General), M. H. Quayle (Clerk of the Rolls), E. M. Gawne (Speaker of the House of Keys), the Rev. W. B. Christian (a member of the Legislature), Capain M. W. Goldie, Major J. S. Goldie-Taubman, W. F. Moore, John Thomas Clucas, W. B. Stevenson, Evan Gell, John Taggart, and John C. Gold-

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smith. Major Taubman, afterwards Sir John Goldie-Taubman, was appointed the first Chairman.

Several important changes were subsequently made in the Board, and when the Peel line was opened in July, 1873, it comprised the following: His Grace the Duke of Sutherland, *Chairman*; Sir John Pender, M.P., *Vice-Chairman*; the Hon. F. A. Stanley, M.P., of Witherslack, Lancashire; Major J. S. Goldie-Taubman, Speaker of the House of Keys; the Rev. W. B. Christian, H.K.; Mr. J. T. Clucas, of Sunnyside, Isle of Man, and Mr. Geo. Sheward, of 17, Leinster Square, London.

There have been only seven changes in the Chairmanship during the fifty years of the company's existence. We append their names, date of appointment and tenure of office:—

1st Feb.	1871	Major J. S. Goldie-Taubman	1½ years.
14th Nov.	1872	Duke of Sutherland	7 years.
6th March	1879	Sir John Pender ...	17 years.
4th March	1897	Sir J. S. Goldie-Taubman	2 years.
9th Feb.	1899	Sir J. Denison Pender	8 years.
26th June	1907	Mr. D. Maitland ...	12 years.
4th March	1919	Mr. E. T. Kissack (Present Chairman)	4 years.

The present board of directors comprises:—*Chairman*, Mr. Edward Thomas Kissack, Eyreton, Douglas, Isle of Man; *Deputy-Chairman*, Mr. John Leigh Goldie-Taubman, J.P., C.P., M.L.C., The Nunnery, Douglas; Mr. George Henry Wood, J.P., Oakley House, Douglas; Mr. Alfred Peter Penketh, Sea View Villa, Port Soderick, Isle of Man; and Mr. William Henry Kitto, J.P., Burnside, Union Mills, Isle of Man.

The Isle of Man Railway system is symbolic of the three-legged coat-of-arms of Man. It has three main branches. From the chief terminus at Douglas there are two distinct sections—to Peel and to Port Erin, whilst the third, to Ramsey (the old Manx Northern Railway), leaves the main Douglas-Peel line at St. John's.

All trains from Douglas for Peel have a through section for Ramsey, which is detached at St. John's. Prior to the amalgamation the Ramsey portion was always composed of Manx Northern Railway coaches. Leaving Douglas the first station on the Peel line is Braddan, 1½ from the terminus. This station is not now regularly called at by the week-day trains. On Sundays in the season, when services are held in Kirk Braddan Churchyard, special trains are provided for the traffic. A mile distant is Union Mills station, reached in 6 min. from Douglas, the next station being Crosby, 4¾ miles from Douglas. We may here observe that the Isle of Man Railway carriages are hung so low that platforms

PEEL STATION.

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PORT ERIN STATION.

are scarcely needed, and are usually not provided at the wayside stations on the original Isle of Man Railway sections of the system. To facilitate entraining and detraining the carriages are provided with two footboards. St. John's, the junction station of the system, is $3\frac{3}{4}$ miles from Crosby. It is a crossing station, and some trains from Peel are timed to arrive there to give a connection between Peel and Ramsey, as well as *vice versa*. The distance from Douglas to Peel is $11\frac{1}{2}$ miles; the trains occupy just about 40 minutes on the journey. The business traffic between Peel and Douglas is considerable. During most of the year there are six trains each way on weekdays and three on Sundays. In the summer the service is considerably augmented, on weekdays 11 trains running each way daily, with an extra late one on Saturdays—11 p.m. from Douglas and 10.10 p.m. from Peel. Two of the summer trains for Peel and one from that town do not have connections to or from Ramsey.

The Ramsey portion of the train from Douglas is detached from that for Peel just before the St. John's station is reached, and when the Peel part has been drawn forward to the station another locomotive hooks on to the Ramsey section and draws it alongside a different platform at St. John's. The two trains leave St. John's side by side, and so travel for about a third of a mile, when the Ramsey train turns off to the right. A run of $1\frac{1}{4}$ miles brings us to Peel Road station and $1\frac{3}{4}$ miles further on we arrive at St. Germains, a village on the west coast of the island, the same distance from Douglas as Peel, which is about 3 miles to the south. Conditional stops are made at St. Germains. The line runs along the west coast for 4 miles to the next station, Kirk Michael, which is a passing station. The route now turns north-east, and by the time Ramsey is reached the train has twice crossed the island from sea to sea.

Ballaugh, $18\frac{1}{2}$ miles from Douglas and $6\frac{3}{8}$ from Ramsey, is the next station, which, with Sulby Bridge, are crossing stations. Sulby Glen station is between Ballaugh and Sulby Bridge, $2\frac{1}{8}$ miles from the former. There is one station—Lezayre—between Ramsey and Sulby Bridge, $1\frac{3}{4}$ miles from the former. At Lezayre conditional stops are made by the trains. The journey of 25 miles from Douglas to Ramsey occupies from 75 to 80 min. On Saturday nights, during the season, an extra train is provided in each direction between Ramsey and Ballaugh. There are two steel lattice girder viaducts on the Ramsey branch, each with three 60-ft. spans; one is across Glen Wyllm and the other over Glen Mooar. At Ramsey the lines are continued down to the

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harbour, so that goods can be loaded direct from ships to tracks on the quay and *vice versa*.

The Port Erin line branch diverges to the left from the Peel line just outside Douglas station, and immediately crosses the river by a steel girder bridge. It curves around the Douglas Head promontory and reaches the coast at Port Soderick, 3⅛ miles from Douglas. It then strikes inland to Santon, 2½ miles distant, then on to Ballasalla, 8½ miles from Douglas, but is on the east coast again at Castletown, the next station, 1½ miles distant. Again leaving the coast there are stations at Ballabeg and Colby, distant, respectively, 1½ miles and 3 miles from Castletown. A mile and three-quarters further on the shore is again struck—at Port St. Mary; then the line cuts across the south point of the island for ¾-mile, and reaches its terminus at Port Erin, situate near the southern extremity of the west coast. There are 12 trains each way on weekdays over the Port Erin line, with an extra one late on Saturday night. On Sundays there are three trains each way. The trains are mostly arranged to leave Douglas either at the same time or within a few minutes of those for Peel and Ramsey. The distance of 15½ miles is usually covered in 55 min., including stops at all stations.

The St. John's and Foxdale Railway, on which are run only two trains each way on weekdays, was built for mineral traffic. It branches from the old Manx Northern Railway near St. John's and crosses the Peel-Ramsey line by an overbridge. It climbs the Slieuwhallin Mountain for the whole of its length (nearly 3 miles) at 1 in 49. It terminates in the lead mines at Foxdale. There is an intermediate station at Waterfall (1½ miles from St. John's), at which the trains call by signal. A separate platform for the Foxdale branch is provided at St. John's station.

Some particulars as to the permanent way may be interesting. The line is single, with crossing places at principal stations. The gauge is narrow, only 3 ft. The rails as originally laid were iron, 45 lb. per yard, but were afterwards substituted by steel rails, 56 lb. to the yard. Steel rails, 60 lb. to the yard, are now being laid. The sharpest curve is 10 chains and steepest gradient 1 in 65.

Appended is a list of the stations :—

Peel Line.—Four stations, *viz.*, Union Mills, Crosby, St. John's and Peel.

Port Erin Line.—Eight stations, *viz.*, Port Soderick, Santon, Ballasalla, Castletown, Ballabeg, Colby, Port St. Mary and Port Erin.

Ramsey Line.—Seven stations, *viz.*, Peel Road, Kirk Michael, Ballaugh, Sulby Glen, Sulby Bridge, Lezayre and Ramsey.

Foxdale Line.—Two stations, *viz.*, Waterfall and Foxdale.

MR. G. H. WOOD,

A Director of the Company, Manager and Secretary, 1876–1903.

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MR. E. T. KISSACK,
Chairman of the Board.

Mileage is as follows:—Peel line, 11½ miles; Ramsey line, 16½ miles; Port Erin line, 15½ miles; Foxdale line, 2¾ miles; total mileage, 46¼ miles. Rolling-stock appears to be almost too extensive for the mileage, but it must be remembered that the circumstances of the island are somewhat peculiar and out of the common. The island is a popular watering-place, and in the "season," say, from Whit Week to the end of September, the population, and consequently the demands on the company, are quadrupled, and rolling-stock must be sufficient to enable the increased traffic to be efficiently coped with. At present the rolling-stock comprises 15 locomotives, 117 carriages and 151 wagons. Of the locomotives, one is a six-wheeled-coupled side-tank engine with cylinders 13½ in. by 18 in. and working pressure of 150 lb. to the square inch, weighing, when fully loaded, 24 tons, and capable of hauling, on the level, 300 tons at 25 miles per hour. The other 14 locomotives are four-wheeled-coupled side-tank engines with pony trucks, the outside cylinders being 11 in. by 18 in., the steam pressure 160 lb. to the square inch, and the weight, when fully loaded, 18 to 20 tons. Their hauling power is, on the level, 220 tons at 25 miles an hour. All these were built by Beyer, Peacock & Co., Ltd., Manchester, and the six-wheeled engine by Messrs. Dubs, of Glasgow.

The majority of the 117 carriages are of the bogie type, 37 ft. in length overall, and 8 ft. 6 in. wide. Their weight is from 9½ to 12 tons, and they carry 48 passengers. The wagons are four-wheeled, 16 ft. in length overall, 6ft. 6 in. wide, and carry 6 tons.

As an investment the Isle of Man Railway Company must be quite satisfactory to the shareholders. From the very first year the company has paid a dividend, increasing as the time went on, varying from 2 per cent. the first year, until it has reached, with bonus, 6 per cent. In addition to that, a reserve and renewal fund, now amounting to £40,000, has been accumulated, every penny of which is invested in first-class securities away from the business of the company.

The gratifying result is that the company's shares are regarded as gilt-edged security of the most approved type. Further confirmation of the progress and popularity of the company is shown by the growth of its revenue during its half-century of existence. Its first year's revenue of £6,405 has grown to £80,125, the amount of its last completed year. Its revenue expenditure has increased from £3,189 to £57,645, and its capital expenditure from £177,810 to £364,134; its mileage from 11½ to 46¼; its revenue in reserve, in addition to its reserve fund, from £500 in 1894 to £15,275 in 1922; and its rolling-stock—locomotives, carriages and wagons—from a total of 58 to 283.

Even the troublous and exhausting

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period of the great war, although it injuriously affected every class and every business, did not, to any appreciable extent, retard the onward progress of the Isle of Man Railway Company.

As we have said, the gratitude of the people of the little island is due to the originators and promoters of the Isle of Man Railway Company who, in the comparatively short period of the life of the company, released the Manx community from the semi-barbarism which characterised the transport system of fifty years ago and endowed the island with a railway system which, even now, is quite up-to-date, and which will, while under the present satisfactory control, undoubtedly be developed and extended as the necessities of the Isle of Man expand and demand.

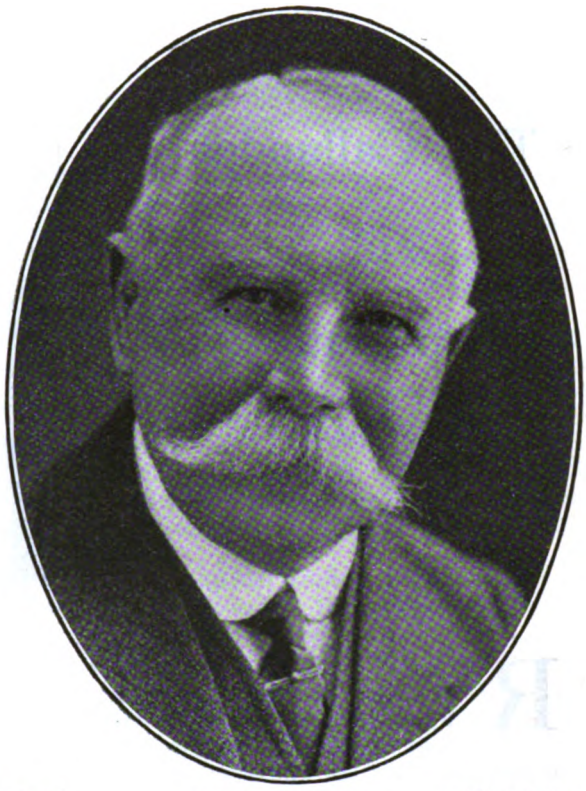

Photo.] **MR. T. STOWELL,** [*Elliott & Fry.*
General Manager and Secretary.

In conclusion, having detailed the establishing and progress of the Isle of Man Railway, a brief description of the scene of its operations may be usefully added. The island is centrally situated in the Irish Sea, and a short voyage from either England, Wales, Scotland or Ireland will reach the principal town. Douglas is beautifully situated on the margin of one of the most beautiful bays in the world, about three miles across, and bounded by gigantic headlands. Rising behind the town is a range of mountains, radiating from which are valleys with rivers and waterfalls, filled with trees, and with verdure clad. The island is only 30 miles long by 11 wide, but there are few places so rich in scenic beauties of mountain and valley, the whole surrounded by sea water of crystal purity.

This gem of the Irish Sea is made easily accessible by excursions run by all the principal railway companies on the mainland. Its ease of access may be shown by the fact that the writer has breakfasted in London in the morning and dined on the island in the evening of the same day.

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The Callander and Oban Railway.

By J. F. GAIRNS.

OBAN STATION.

RANKING with the Perth-Inverness line of the late Highland Railway, and the West Highland section of the late North British Railway, the Callander and Oban Railway, with the Ballachulish Extension, constitutes the third of the three great Scottish mountain lines, in each case a hundred miles, or nearly so, virtually continuously amidst mountain surroundings vying for scenic interest, if not in regard to the heights of the adjacent peaks, with those of the famous mountain lines in other lands. This line has on several occasions received attention in the pages of the RAILWAY MAGAZINE, notably in the issues of September, 1903, August, 1904, and August and September, 1912. It will, therefore, be sufficient to deal with it on the basis of a journey through from Stirling to Oban and to Ballachulish. In introduction, however, the principal historical facts may be briefly reviewed.

The Callander and Oban Railway Company was constituted in 1865. The Dunblane, Doune and Callander Railway was already in existence, having been opened in 1858. The Callander and Oban line was opened: Callander to Killin Junction, 1870; Killin Junction to Tyndrum, August, 1873, thence to Dalmally, May, 1877; and to Oban, July, 1880. At Balquhidder, at first known as Lochearnhead, the line from Crieff makes connection. This route, with connecting lines, was opened, Perth to Methven, 1838; Methven Junction to Crieff, 1866; Gleneagles (previously Crieff Junction) to Crieff, 1856; Crieff to Comrie, 1893; Comrie to St. Fillans, 1901; St. Fillans to Balquhidder (Lochearnhead), 1905. The Callander and Oban line has always been worked by the Caledonian Company, and is now included in the London Midland and Scottish Railway.

Dunblane is the ordinary junction for the Callander and Oban line, but trains which are not through to or from Glasgow use Stirling as their southern terminus. In some instances, ordinary Caledonian main line engines work the trains to and from Callander, the special C. and O. engines being attached or detached there, though this is mainly a traffic arrangement, convenient in the case of certain trains. At Dunblane there is an island platform on the down side, thus enabling branch trains to wait on the outer side to make connections. To Doune is double track, and the country mainly pastoral. Thence to Callander is single line, controlled by electric train tablet, as is the whole of the Callander and Oban line. The scenery continues to be of lowland character, though picturesque, but signs of the

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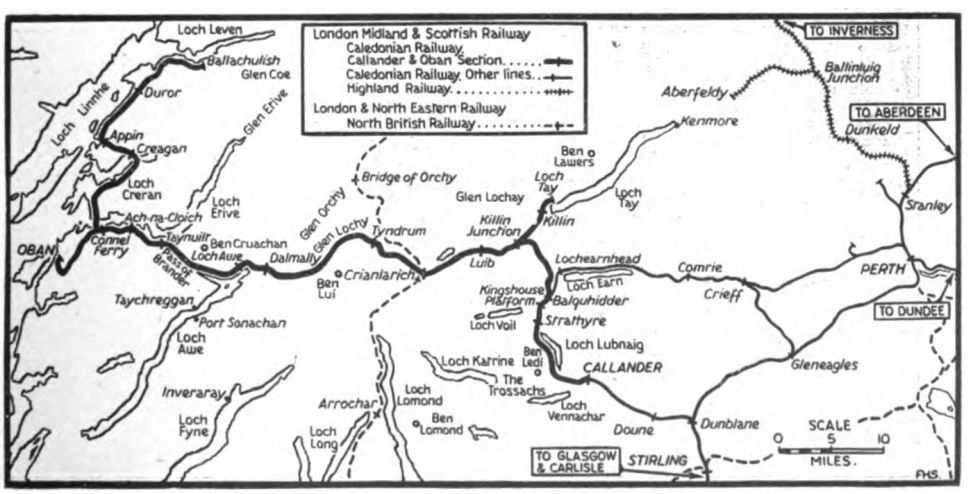
mountain country beyond show themselves. Between Doune and Callander is an intermediate crossing place—Drumvaich Crossing—to break up the long section of nearly 7 miles between stations. The original line diverged into what is now the goods station at Callander, the present station having been built when the Oban line was made. Callander station is distinctly picturesque, an ornamental clock tower surmounting the footbridge, and the station buildings being neat and attractive, while the platforms are decorated florally. It also has refreshment rooms on the platforms. On the up and down sides there are short bay lines from which locals can start as required. For down trains there is also a ticket platform, half a mile or so short of the station, but this is now used only by a few trains.

Crossing the River Leny by a bowstring girder bridge, mountain country is entered in the Pass of Leny, and Ben Ledi and Ben Vane on the one side (the former skirted by the line), Ben Each, and, in the distance, Ben Vorlich, on the other, give evidence of the nature of the country traversed. The Falls of Leny can be seen on the right providing the intervening foliage is not too full. "St. Bride's Crossing," at the head of the Pass of Leny, is now only used as a crossing place at periods of special pressure. For nearly two miles the line then proceeds along the western shore, and almost at the water's edge, of Loch Lubnaig—"the crooked lake." A short distance beyond St. Bride's Crossing is Craignacailleach Platform, used by children of railway servants going to school in Callander by the 5.40 a.m. from Oban and the 6.45 p.m. from Callander, daily except Saturdays. At the picturesque little station of Strathyre, both platforms are adorned by ornamental shrubs, and on the up side there is a fountain, rockeries, rustic gateways, &c., lending further interest to this pretty station among its beautiful natural surroundings.

Before reaching Strathyre station the River Balvag is crossed. It keeps close company with the railway until near Kingshouse Platform, where a glimpse is had of the hills encircling Loch Voil. Kingshouse Platform is used as a halt, trains calling as required, for the convenience of visitors to the Braes o' Balquhidder.

Balquhidder station, at first known as Lochearnhead, is the junction for the line to Crieff, Gleneagles and Perth. The branch comes in from the north, paralleled by the Oban line for some distance, from the head of the Loch Earn. Balquhidder station has an island platform on the up side to provide for trains in connection.

Leaving Balquhidder the Oban line climbs steeply along the hillside as it finds its way up Glen Ogle, overlooking in the ascent the Crieff line as it follows the shores of Loch Earn eastward, and giving views over the waters of the Loch, amidst their mountain setting,



MAP OF CALLANDER AND OBAN RAILWAY AND LINES IN CONNECTION.

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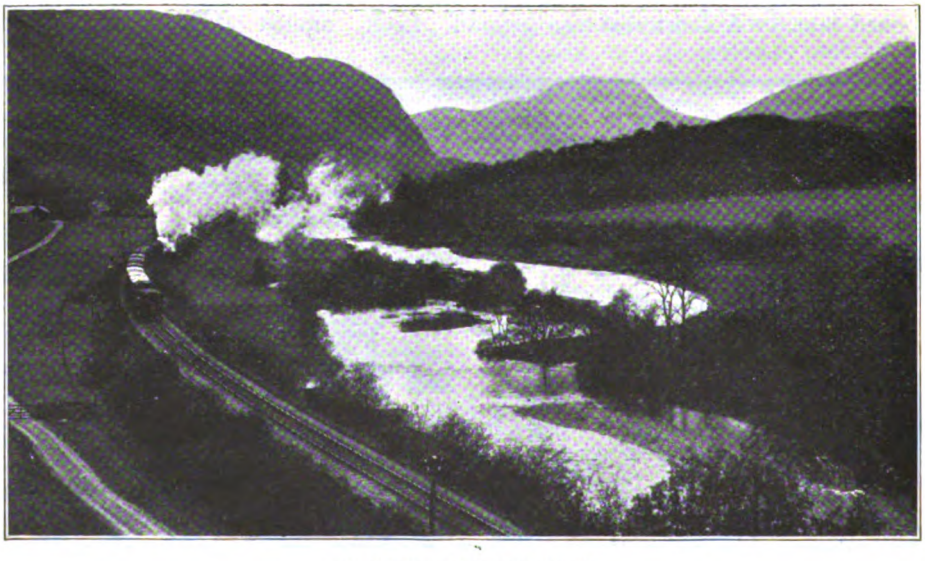
which are said to be the finest in the British Isles. On the occasion of the writer's tour of this line, having travelled by the night train from London, the scene presented at this point, with the rising sun glowing over the expanse of Loch Earn opened out, was one which, once seen, could hardly be forgotten, associated as it was with " running " mist clouds in all directions on the mountain sides as the dawn gave place to day.

Nearly 8 miles separate Balquhidder and Killin Junction stations, though there is an intermediate crossing—Glenoglehead. This was the site of the original Killin station, before the opening of the Killin Branch Railway. The whole length of " gloomy " Glen Ogle—a wild rocky valley, four miles in length, described as the Khyber Pass of Scotland—is traversed, with its rocky boulder-strewn slopes, the railway being carried in places on brick or masonry viaducts around the face of the rock where the cutting of a ledge was well-nigh impossible. For most of the ascent the view from the train is down almost precipitous slopes, continued upwards on the other side.

At the northern end of the Pass the line curves westward, overlooking the Loch Tay branch which runs from Killin Junction to the little town of Killin, with an extension of about a mile to a pier on Loch Tay to connect with the railway steamers which serve the whole length of the Loch, glimpses of which are had from the Oban train. The branch is on a lower level and its track can be seen for a long distance from the main line. The branch railway is one of very heavy gradients. At Killin Junction it makes connection with the main line which has descended from Glenoglehead to meet it. The station here has the usual island platform on the up side, to accommodate the branch trains clear of the main line.

Continuing westward past Luib to Crianlarich, Glen Dochart is traversed, with the River Dochart, until it merges into Loch Iubhair, succeeded in turn by Loch Dochart, and the public road, for company close alongside. Here splendid views are had on both sides, bare mountain slopes being relieved by wooded areas, while rushing burns and streamlets add further interest. On both sides are peaks of considerable height, notably Ben Dheiceach (3,074 ft.) to the north, Ben More (3,843 ft.) immediately ahead, and Stobinian (3,821 ft.) to the south, with many others in the distance.

Crianlarich is important as it provides for interchange traffic with the West Highland line to Fort William and Mallaig, which here crosses. The stations are within a short distance, and there is siding connection for interchange goods traffic. The Callander and Oban station is a neat



IN THE PASS OF LENY.

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LOCHEARNHEAD VIADUCT, CRIEFF AND BALQUHIDDER LINE.

Track of Oban line is dimly discernible high up on the hillside.

double-platformed station with rather attractive buildings on the down side. Just beyond the station the North British Railway crosses by an overbridge, and Crianlarich Junction is then reached, this controlling the connection with the West Highland line.

Onwards through Strath Fillan magnificent views are had, and for some miles the West Highland line runs parallel, but on the opposite side of the valley, climbing up the hillside, after crossing the viaduct over the River Fillan until both lines are almost on the same level, with the valley between. Both lines have stations at Tyndrum (a favourite mountain resort), though these are some half-a-mile apart. The Callander and Oban station is a neat tree-shaded erection, with the goods yard at a lower level.

Passing Tyndrum station a final view is had of the West Highland line ere it turns its course northwards, while the Callander and Oban line makes a long sweep southwesterly through Glen Lochy, wild and bare. An intermediate crossing —Glenlochy—breaks the 12-mile run from Tyndrum to Dalmally. Approaching the rather pretty station at the latter place, Glen Orchy is joined, fine views being had along it. Dalmally, at the foot of Glen Orchy, has been described as " the loveliest spot in all that lovely glen." A short run of less than 3 miles crossing the Orchy and rounding a bay on Loch Awe, and incidentally giving beautiful views up the Loch, and Loch Awe station is reached, right on the water side, and with a pier alongside for the steamers which ply along the Loch. For four miles or so the line runs high on the base at Ben Cruachan and follows the shores of the Loch through the gloomy Pass of Brander in which the waters of the loch merge into the brawling River Awe—most turbulent of Highland salmon streams. Three miles beyond Loch Awe station the Falls of Cruachan Platform is a convenience for visitors to the celebrated Falls, a glimpse of which is had from the train in passing. The crossing place is, however, Awe Crossing, a mile or so beyond. A further run of 4½ miles and Taynuilt is reached, beyond which the shores of Loch Etive are followed to Connel Ferry, a run of 6½ miles, with one intermediate station—Ach-na-Cloich—and providing lovely views over the loch and the hills and mountains beyond.

At Connel Ferry, junction for the Ballachulish line, there is a wide island platform serving the up and down main

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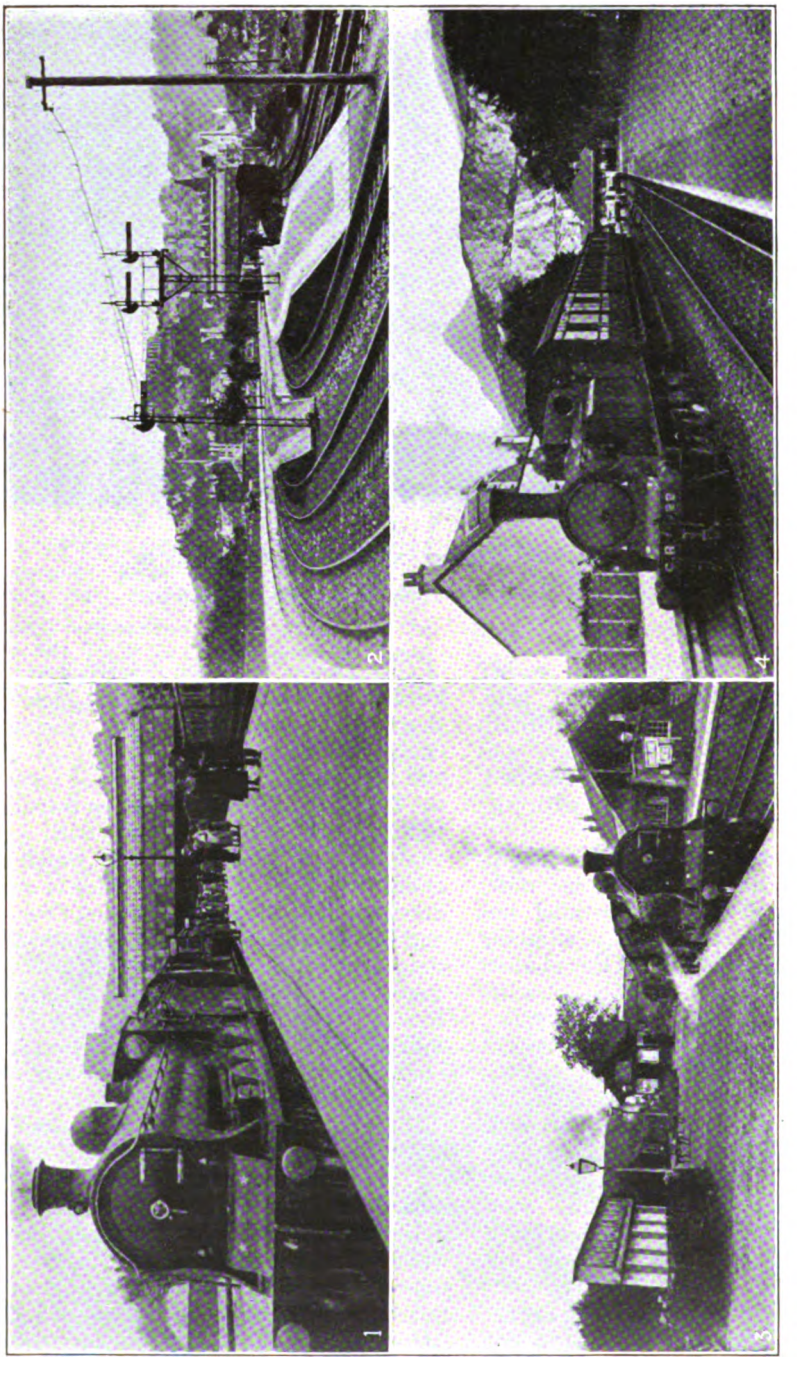

Photos.] 1. PLATFORM SCENE AT OBAN. 2. GENERAL VIEW OF OBAN STATION. [*J. F. Gairns.*
3. CONNEL FERRY JUNCTION 4. AT BALLACHULISH TERMINUS.

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lines, and a single platform on the up side designed for branch trains, though generally these use the main platform to facilitate passenger and luggage transfer. The station has sidings and goods yard. Its height above the village entails high viaducts both on the Oban line and on the approach to the famous Connel Ferry bridge, crossed by Ballachulish trains. Fine views are had of the bridge from the Oban line as it pursues its course high up on the hillside until it cuts inland to attain the summit of Glencruitten. This is at the top of the 3-mile incline at 1 in 50 by which the line zig-zags down to reach the shore at Oban, giving views now over Oban and the landward hills above it, and then, with final sweep round, over the Kerrera Sound and Kerrera Island, to the mountains of Mull and the Firth of Lorne.

Before reaching the terminus a stop is usually made at Oban ticket platform, adjacent to the goods yard and engine shed. Oban station has picturesque buildings surmounted by a clock tower, and the circulating area is adorned with hanging flower baskets. Refreshment and dining rooms are provided. The three main platforms are partly covered by a glazed all-over roof, though their outer curved portions are open. Alongside are two open arrival platforms permitting cabs, &c., to come directly alongside the trains. The station is immediately alongside the steamer pier and harbour premises, the location being peculiarly convenient to the principal hotels, the sea front, and the Corran Esplanade.

Oban—"a little bay"—so widely favoured as a holiday resort, as a boating and yachting centre, and as headquarters for touring the Highlands and the Hebrides in all directions, has been described as the "Charing Cross of the Highlands." Whether readers will agree with this as a happy choice or not, it certainly justifies it as a great steamer traffic and touring centre. Messrs. David MacBrayne, Ltd., operate steamers between Oban, the Sound of Mull and Tobermory to Castlebay and Lochboisdale ("Inner Island Service"), Ardrishaig *via* the Crinan Canal, to Staffa and Iona, to Ballachulish, Kentallen and Fort William, and thence *via* the Caledonian Canal to Inverness, besides many local trips and excursions. Numerous circular tours are also operated, in conjunction with the London Midland and Scottish Railway, rail, motor-car and steamer. Many of these tours are of an extensive nature, and fares are quoted for the throughout journeys.

Returning to Connel Ferry, the Ballachulish line may now be considered. Commencing at Connel Ferry station, the branch train reaches the famous bridge by a viaduct approach over the village of Connel Ferry. The Connel Ferry bridge, claimed to be the Forth Bridge's "biggest British rival," was opened for traffic in August 21, 1903. The bridge, which is of cantilever type (hence the analogy suggested with the Forth Bridge), has a length of 524 ft. between the two piers, the clear span being 500 ft., and the headway above high-water level, 50 ft. Extreme height from high water to the topmost point of the bridge is 125 ft., while the middle span, carried by the two cantilever spans, has a length of 232 ft. This bridge not only enabled a district hitherto most inconveniently situated in regard to rail traffic to be placed in communication with the Callander and Oban Railway at Connel Ferry, but provided a means of crossing Loch Etive, where previously a very lengthy detour had to be made to get from one side to the other, the only alternative being a very uncertain ferry service.

The difficulty having been solved from the railway point of view, there still remained the problem of providing for the transit of motor-cars and other road vehicles across the Loch, and for several years after the opening of the bridge the Caledonian Railway Company conveyed private motor-cars across the bridge by placing them on flat trucks and hauling them, passengers included, by road motor vehicles adapted to run on rails across the bridge.

This method, as indicated, was continued for a considerable time, but, several years ago, the Caledonian Railway Company adopted the alternative method of adapting the bridge also for the passage of motor vehicles, cycles, etc., under their own power. There is not, however, sufficient room for a roadway clear of the railway track, so that it is necessary to restrict the passage of road vehicles to periods when no train is signalled. At each

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end of the bridge, therefore, gates, under the control of the bridge-keeper, are provided to close the bridge to road traffic when a train is due, and the tablet instruments are controlled by electric circuits in connection with the road gates, to ensure that, unless the gates are properly closed, a tablet cannot be used. The roadway over the bridge comes close up to the rails, there being just sufficient room for a vehicle to pass between the rails and the side of the bridge, and the bridge-keeper has to see that vehicles from both directions are not allowed on the bridge at the same time. These facilities apply only to private motor-cars and horse-drawn vehicles, and not to trade vehicles, of either class. Cyclists and pedestrians also use the bridge. In each case the crossing of the bridge is subject to toll, the men in charge at the Connel Ferry and Benderloch ends acting as toll-keepers. It may be mentioned that, in August last, the bridge was used by 6,009 foot passengers, by 852 motor-cars, and by 290 cycles.

Passing North Connel halt, at the north end of the bridge, the line follows the shore to Benderloch station. At Barcaldine Crossing a platform is provided, where trains call as required. So far, the country traversed has been "comparatively" flat and uninteresting, but as it crosses a peninsula to reach the shores of Loch Creran, mountain vistas again open up. Short of Creagan station the line crosses the Narrows to the Loch by a two-span girder bridge with approach viaducts, fine views being had on both sides.

Again crossing a peninsula, Appin is reached, and for the remainder of the journey the line follows closely the shores of Loch Linnhe. As it curves round after leaving Appin station, a good view is had of the ruins of Castle Stalker. Alongside the Loch splendid views are had, and Duror and Kentallen stations are sufficiently picturesque to harmonise with the general character of the scenery. At Ballachulish Ferry station tickets are collected, and the line then curves round to follow the shores of Loch Leven to the terminus at Ballachulish. This is a neat two-platformed station, with dining and refreshment rooms, and the district is impressively mountainous. A short distance from the station is a small harbour, whence a David MacBrayne steamer used to ply three times daily to and from the Kinlochleven wharf of the British Aluminium Company, for goods, passenger and mail traffic. This steamer service has now been withdrawn, a road having been constructed by German prisoners during the war and opened for traffic at the end of last year. A motor service is now operated three times daily each way between Ballachulish and Kinlochleven.

A trip on this steamer was an interesting addition to the journey by rail. The distance is about eight miles, and speed somewhat moderate, but from end to end one was surrounded by scenic attractions, particularly when passing the mouth of the Pass of Glencoe and looking along its mountain-encompassed course. The wharf at Kinlochleven is connected with the British Aluminium Company's premises by a private line, both trains (goods traffic only) and cranes on the wharf being electrically operated.

Traffic on the Callander and Oban line is complicated by the fact that gradients are systematically so severe, 1 in 50 occurring several times for considerable distances, curves are numerous, and in several places reduced speed is necessary owing to the danger of tumbling rocks, notably alongside Loch Lubnaig in Glen Ogle and the Pass of Brander, and automatic alarm wires are erected on some stretches a fall of rock encountering them causing warnings to be given in adjacent signal cabins and watchmen's huts, and putting the special signals to danger. On the steep grades both goods and passenger trains are operated under special restrictions, stops being made at the summits and brakes tested, or, on goods trains, a proportion pinned down before descending. Mountain mists and fogs, occasional torrential rainstorms or cloudbursts and other "episodes" peculiar to mountain lines, also complicate the working at times. But even in winter there is a steady traffic in meeting the transport needs of the wide areas rendered accessible by this line, of the various townships and villages (many are centres for other places within a considerable radius), country houses, castles and large estates, and in carrying mails, supplying coal and, in due season, conveying cattle and other live stock.

The winter train services are, naturally,

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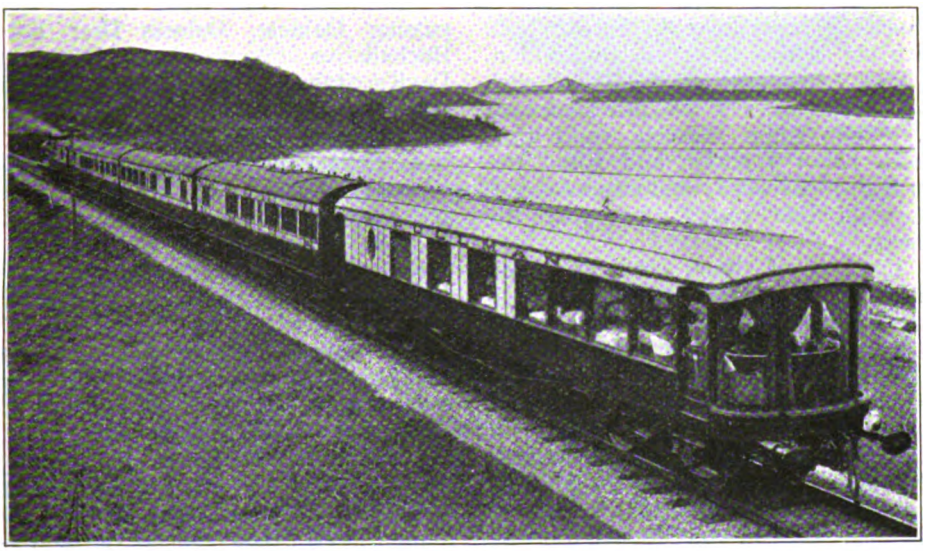
much reduced as compared with those of the summer, but even the winter service provides four through trains each way daily, a local each way between Oban and Dalmally, and several additional trains between Callander and Glasgow. Sleeping cars and through carriages are provided between Euston and Oban in winter on Fridays only from London, returning on Mondays. The down vehicles are conveyed on the 8.25 a.m. from Stirling, due in Oban at 12.15 p.m. It is also possible to reach Oban at 4.45 p.m. from London by the 11 p.m. from Euston the night before, and by the 5 a.m. from Euston through carriages between Glasgow and Oban.

Between the seasons the services are somewhat improved, the through carriages and sleeping cars running daily during July, August, September and the first half of October, and are somewhat expedited. During the summer months, however, there is quite a good service and at times the loads conveyed are considerable. The London through carriages and sleeping cars leave Euston at 7.50 p.m. and go forward from Stirling at 6 a.m., reaching Oban at 9.50 a.m. They are followed by the 8 a.m. from



TRAIN WITH PULLMAN OBSERVATION CAR IN REAR.

Connel Ferry Bridge in distance.

at 9.50 p.m., the same night, though not, of course, with through carriages. A further service is given by the 1.30 p.m., reaching Oban at 4.44 a.m. next morning. This latter train, 12.15 a.m. from Stirling, is notable in that it does not stop at several stations. In the opposite direction the 5.40 a.m. from Oban enables London to be reached at 7.30 p.m. and the 9.10 a.m. at 10.45 p.m. The 11.50 a.m. gives a connection to London due at 5 a.m., while the 5 p.m., which conveys the through carriages and sleeping cars on Mondays, is due in Euston at 6.55 a.m. To and from Edinburgh and Glasgow there are quite good services with Glasgow. The 9.45 a.m. from Glasgow (Buchanan Street), leaving Stirling at 10.35 a.m., is the favourite train for Glasgow and Edinburgh passengers. It conveys a Pullman observation car, which has proved very popular indeed since its introduction. This train reaches Oban at 2.36 p.m. Connecting with the 12.10 p.m. from Glasgow (Buchanan Street), the 1.5 p.m. from Stirling reaches Oban at 4.49 p.m., while the 5.10 p.m. from Glasgow (Stirling 6 p.m.), which conveys a third-class Pullman buffet car, is due at Oban at 9.40 p.m. The night service off the 10 p.m. from Glasgow reaches Oban at 4.50 a.m. There are also seven or eight

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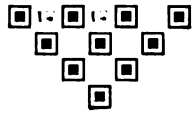
additional trains between Stirling and Callander. In the opposite direction the trains from Oban are: 5.40 a.m. to Glasgow, giving a connection to London, due 7.30 p.m.; 9.10 a.m. with through carriages for Glasgow and giving a London connection due 10.45 p.m.; 10 a.m. local to Loch Awe; 11.15 a.m. additional train during June, July and August, with third class Pullman buffet car; 11.50 a.m. to Glasgow; 3.35 p.m. for Glasgow with Pullman observation car; 5.15 p.m. for Glasgow, with through carriages and sleeping cars for London until September 30 (commencing September 3, the through carriage and sleeping saloons for London will be run on the 6.25 p.m. from Oban); and, commencing September 3, the 6.25 p.m. to Stirling, with connection to London, due there 7.40 a.m. On the Ballachulish branch three services are provided each way. The Killin branch train runs between Killin Junction and Killin and on to Killin Pier when required to connect with main line trains and with the steamers.

A number of tours and excursion arrangements are in force combining rail, steamer and coach facilities. In summer the Loch Tay steamers between Killin Pier and Kenmore make three trips each way daily, and combined tours are arranged from Glasgow and Edinburgh, &c., via Callander to Killin Pier, thence by steamer to Kenmore, by coach to Aberfeldy, returning via the Highland section of the London Midland and Scottish Railway and Perth. This is also arranged the other way, providing a most attractive "round tour."

On Loch Awe the railway steamer makes one journey each way daily from Loch Awe Pier to Ford, a steam launch also plying between Loch Awe Pier and Taycreggan and Port Sonachan. From Oban and other centres a combined tour is provided to Loch Awe station by rail, thence by steamer to Ford, returning to Oban by motor coach through the Pass of Melfort or in the reverse order. The famous "Trossachs" tour centres upon Callander, from whence motors run to Trossachs, linking up there with the Loch Katrine steamer, and so on to Loch Lomond. Other associated services are by motor launch between Taynuilt and Lochetivehead, by coach between Ballachulish and Glencoe, and by motor between Oban and Easdale. A special tour arranged in conjunction with the railway is the Glencoe and Glenetive tour, by rail to Achnacloich station, thence by motor launch from Achnacloich to Loch Etive, passing Ardchattan Priory, Bonawe, &c.; motor drive from Lochetivehead, passing Dalness, Dalness Deer Forest, Buchailetive (Shepherd of Etive), the Devil's Staircase, the "Lord Chancellor," Ossian's Cave, Pass of Glencoe (scene of the massacre); returning home by train from Ballachulish, or the route may be reversed. Cheap daily excursion tickets are issued in summer by the London Midland and Scottish Railway to all stations on or connected with the Callander and Oban and Ballachulish lines.

The locomotives generally employed are the well-known "Oban" 4-6-0's, with 5-ft. coupled wheels, together with Mr. Pickersgill's new "Oban" class recently introduced, though odd trips are taken by 0-6-0 goods engines, which also render assistance on the steep grades. On the Killin branch and the Ballachulish extension 0-4-4 tank engines of the 4 ft. 6 in. class are used. Between Dunblane and Callander main line 4-4-0 locomotives from Glasgow or Stirling and 0-6-0 goods engines are used, as well as the Oban 4-6-0's on the through trains, a change being sometimes made at Callander. The Callander and Oban line and the Ballachulish extension are controlled by electric train tablet apparatus. Ordinary train staff is used on the Killin branch.



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] [*E. A. Gurney-Smith.*

SOUTHERN RAILWAY.

Worthing-London Pullman Car Express passing Bungalow Town, Shoreham.
L.B. & S.C. 4-4-2 engine, No. 423.

IT is my privilege in the present issue to describe one of the most absorbing experiences of the whole thirteen years during which I have been contributing these articles. In the month of December of last year I wrote of a footplate trip on a 2–4–2 tank engine, the fascination of which lay in the fact that a comparatively small locomotive, whose boiler boasted less than a thousand square feet of heating surface and nineteen square feet of grate, and whose total weight was only 66½ tons, was scheduled to take a substantial train for nearly an hour's run over grades simply mountainous in their severity. This month I have to write of my experience on the footplate of the most powerful express locomotive type extant in this country, whose vast boiler contains 3,455 sq. ft. of heating surface, whose firegrate extends to an area of 42 sq. ft., and whose total weight with tender runs out at no less than 148 tons in working order.

With all allowance for the fact that the great "Pacific" was working a train of exceptional weight on very sharp bookings and over gradients which, if not steep, are long and trying in their effect on a heavily-laden engine, the contrast between the two journeys was absolute. On the 2–4–2 tank the most minute knowledge of the road and scientific operation of the engine in the very last degree were necessary to prevent loss of time, or even the "stalling" to which the slightest inattention to either, or adverse conditions of weather, engine or fuel would probably—and not infrequently do—give rise on this exacting journey. On the 4–6–2, even when she was working at her hardest, the impression made on the observer was not so much that of enormous power in course of development as of still more enormous potentialities of traction in reserve.

Let this not be read as the very slightest disparagement of the work of the driver and fireman of the "Pacific" as compared with the crew that worked the tank. Quite on the contrary. For on the trip which I made on the 10.51 a.m. express from Doncaster to King's Cross, by the kind permission of Mr. H. N. Gresley, Chief Mechanical Engineer of the London and North Eastern Railway, No. 1473 was busily engaged throughout in breaking many of the records in the matter of time and speed that I have noted on the Great Northern main line

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in the up direction. Even where records were not being broken, it is safe to say that I have never previously approached most of the times achieved with anything like the load that we carried on this occasion.

Despite the fact that a "Pacific" is now available almost every day, the train concerned even yet does not always run into King's Cross on the stroke of its booked arrival time of 1.55 p.m., so formidable are the difficulties of its working. Every driver with whom I have spoken on the matter confirms the opinion, expressed in my article of February last, that this is the most difficult "turn" on the Great Northern section of the London and North Eastern system to-day, the 5.40 p.m. out of King's Cross not excepted, and, with the possible exception of the Great Western "Cornish Riviera Limited" out of Paddington, no other line has anything comparable to offer, to my knowledge, so far as October to June working is concerned. Yet on this trip of mine we ran from Doncaster to London in 25 seconds over the 184 minutes allowed, despite $2\frac{3}{4}$ minutes over time at the three intermediate stops, and a dead stand of 55 seconds for adverse signals at Balderton Box, just north of Newark, when we needed all the impetus of our high speed across the Trent Valley to help us up the rising grades to Grantham. So both driving and firing were of the highest order.

What were the demands on the boiler of No. 1473 occasioned by an outstanding performance such as this? The leading feature of the Ivatt "Atlantics" on the Great Northern Railway has been—and I think it might be claimed without dispute—the exceptional capacity of their boilers for raising steam. Herein must lie the only possible explanation of such performances, almost subversive of theory in their character, as that displayed by No. 1452 under the expert management of Driver Codd on this very train, and detailed in my March article. This freedom in steam-raising, although doubtless it involved exceedingly hard work for the fireman on that trip, means that an Ivatt "Atlantic" can run for indefinite periods at a comparatively late cut-off and wide regulator opening without getting short of "breath." I cannot see how it is possible otherwise to explain such a performance on the part of an engine with two 20 in. by 24 in. cylinders only.

Now I must confess that it interested me considerably to see how No. 1473

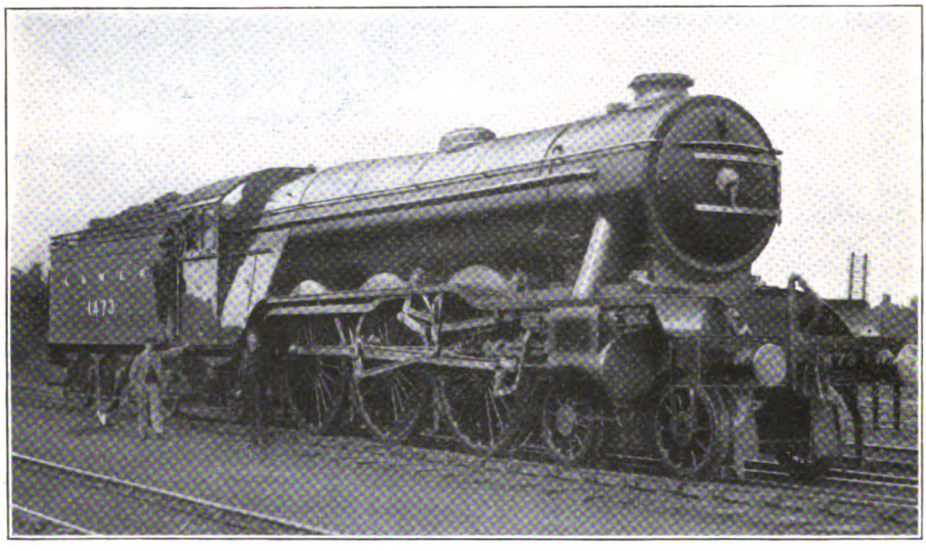

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*J. Hepworth.*

Great Northern three-cylinder 4-6-2 engine No. 1473. Driver Croft is standing against rear coupled wheel.

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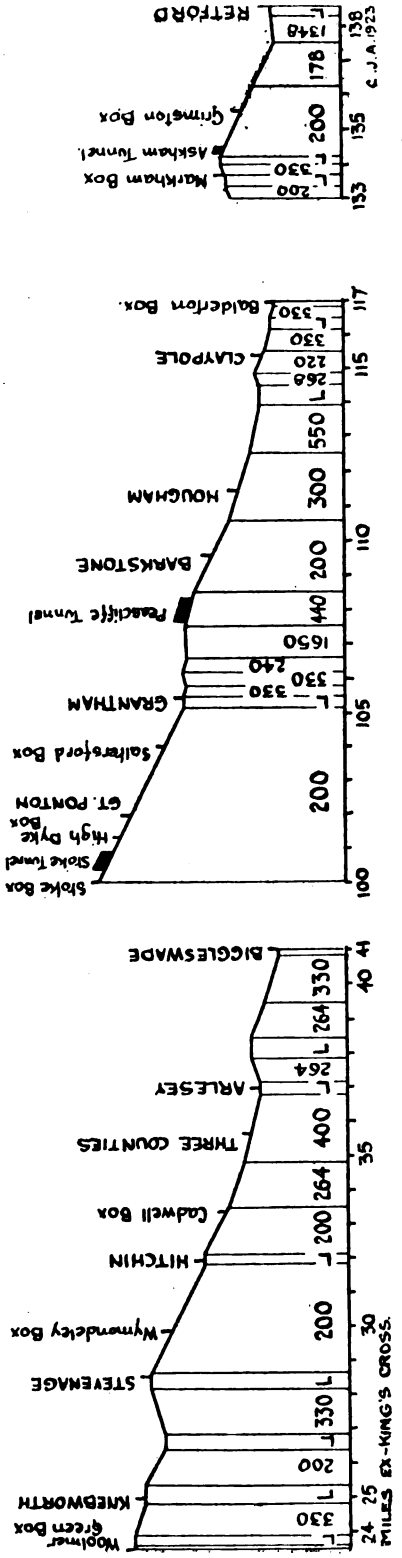

PROFILES SHOWING PRINCIPAL GRADIENTS TO BE CLIMBED BY UP TRAINS BETWEEN DONCASTER AND LONDON

would behave as regards steaming when the heaviest continuous demands were being made on her boiler. The answer was absolutely convincing. Almost immediately, even on the steepest banks, the needle of the pressure gauge responded to Fireman Sisman's shovel; plenty of steam was available whenever and in whatever volume Driver Croft required it; and the most remarkable indication of the reserve power at the driver's command lay in the fact that, although the boiler is pressed to 180 lb. per sq. in., an actual working pressure ranging mostly between 160 lb. and 170 lb. was found ample for the work to be performed, and we once got as low as 140 lb. without the speed appearing to suffer in the slightest degree. Consequently, the engine never "blew off" for a single moment, from the time I mounted the footplate to the time I alighted. Herein is clear proof that the new "Pacifics" are being worked well within their maximum capacity, which should result in their being light on both fuel and maintenance, in proportion to the exceedingly hard work which they are called upon to perform daily.

Another notable feature of the working was the extraordinary smoothness of the running. No. 1473 was, without question, the smoothest-riding locomotive on which I have ever yet travelled. The perfection of Great Northern track—equal to any and second to none in this country—is a matter of common knowledge, and this was, of course, in the engine's favour; but, apart from that, of oscillation off the motion there was practically none, and the numerous notes of times and data that I made *en route* were fully as legible as those written in a coach. This is a testimony both to the efficient balancing of the moving parts and also to the even torque obtained with three high-pressure cylinders whose cranks are set at 120 deg. Here, again, the future maintenance of the engines should benefit considerably, not to mention that of the track, which is far more susceptible to considerations of this character than to those merely of total weight and length of wheelbase of the engines concerned.

With this preamble, let me now proceed to a description of the run, of which the details are set out in the table which appears on the next page.

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L. AND N.E. (GREAT NORTHERN) RAILWAY.

10.51 a.m. Doncaster to King's Cross. Engine: 4-6-2 No. 1473. Driver: R. Croft. Fireman: P. Sisman. Load: 58 axles = 413 tons tare, 440 tons full ex Doncaster; 62 axles = 448 tons tare, 475-480 tons full, ex Grantham.

Distance.	Stations.	Schedule.	Actual.	Speeds.
Miles.		Min.	M. S.	M.P.H.
0·0	Doncaster dep.	0	0 00	—
4·7	Rossington ..	—	8 20	56½
6·5	Piper's Wood Box	—	10 35	51
8·3	Bawtry	—	12 20	66
10·2	Scrooby	—	14 00	70½
12·1	Ranskill	—	15 40	68
16·4	Canal Box ..	—	19 35	66
17·4	Retford .. arr.	21	21 15	—
0·0	dep.	0	0 00	—
3·1	Grimston Box ..	—	5 40	—
4·9	Markham Box ..	—	8 00	48
6·7	Tuxford	—	9 50	—
7·3	Dukeries Junction	—	10 25	71½
11·2	Crow Park ..	—	13 35	80½
12·2	Carlton	—	14 20	80½
15·8	Muskham Box ..	—	17 15	71½
18·5	Newark	—	19 35	68
21·6	Balderton Box arr.	21	23 25	—
	(signal stop) dep.	—	24 20	—
23·2	Claypole	—	28 10	—
27·1	Hougham ..	—	33 00	55½
28·9	Barkstone .	—	35 05	47½
33·1	Grantham arr.	38	40 50	—
0·0	dep.	0	0 00	—
1·5	Saltersford Box ..	—	3 45	36
3·5	Great Ponton ..	—	6 35	44
4·2	High Dyke Box ..	—	7 35	45½
5·4	Stoke Summit Box	—	9 10	46
8·4	Corby	—	12 20	68
13·3	Little Bytham ..	—	16 20	80½
16·9	Essendine ..	—	19 00	82
20·7	Tallington	—	22 00	75
23·6	Helpston Box ..	—	24 25	70½
26·0	Werrington Junct.	—	26 30	69
28·5	Westwood Junct.	—	28 50	61½
29·1	Peterborough arr.	33	30 25	—
0·0	dep.	0	0 00	—
1·4	Fletton Junct. ..	—	3 15	40½
3·8	Yaxley	—	6 25	—
7·0	Holme	—	9 50	59
12·9	Abbot's Ripton ..	—	16 25	50
14·4	Leys Box ..	—	18 15	48
17·5	Huntingdon ..	20	21 20	70½
20·4	Offord	—	24 00	—
24·7	St. Neot's ..	—	28 10	56½
28·9	Tempsford ..	—	32 15	64½
32·3	Sandy	—	35 30	60
35·3	Biggleswade ..	—	38 30	60
39·4	Arlesey	—	42 50	54
40·7	Three Counties ..	—	44 10	61½
43·1	Cadwell Box ..	—	46 40	56½
44·5	Hitchin	48	48 15	—
46·6	Wymondeley Box	—	50 50	48
47·8	Stevenage ..	—	52 20	48
51·4	Knebworth ..	—	56 20	—
54·4	Welwyn	—	59 30	—
58·7	Hatfield	64	63 20	74
63·7	Potter's Bar ..	—	68 35	53½
67·2	New Barnet ..	—	71 55	70½
71·4	Wood Green ..	—	75 20	77½
73·9	Finsbury Park ..	—	77 25	—
76·3	Platform end ..	—	80 30	—
76·4	King's Cross arr.	84	81 25	—

In the earlier part of the week the weather had been very unsettled, culminating in a regular hurricane from the south-west on the previous day—despite which No. 1471 turned up at Doncaster on the 5.40 p.m., with the full load, only a minute behind time!—but the Friday morning broke beautifully bright, with the wind round to the north-west, and only a moderate one at that, which gave us no trouble. The train as made up on starting from Doncaster consisted of seven vehicles (including two 12-wheeled "diners") from Leeds, two vehicles from Bradford, and four (including another dining car) from Hull, making in all 13, or 58 axles, and weighing 413 tons empty and 440 tons full. We left Doncaster on time at 10.51 a.m.

The cut-off of the Great Northern "Pacifics" is limited to a maximum of 65 per cent., and at this and every other start the full figure was employed for the first quarter or half-mile, with the regulator not quite full open—about four-fifths. Out as far as Black Carr Junction we "drave heavily," but the cause soon revealed itself in a dropping-back of the train-pipe vacuum needle, showing that the train brakes were leaking on. This was soon remedied with the ejector, and, with cut-off at 45 per cent. and regulator at two-thirds we then got away in fine style, attaining 56½ m.p.h. before Rossington, and only falling to 51 on the 2¼ miles at 1 in 198 up to Piper's Wood. The next 9·9 miles to Canal Box at Retford were run in 9 min. exactly, with cut-off still

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at 45 and regulator at about one-half, whereby speed did not drop more than from 70½ to 66 m.p.h. up the gentle rise from Scrooby to the point of shutting off steam for Retford stop. Had it not been for the brake episode, our time from Doncaster to Retford would have been quite a minute under the very sharp 21 min. allowed for the 17·4 miles, instead of a quarter of a minute over.

The exit from Retford was one of the classics of a classic trip. I have shown diagrammatically the three worst starts in order that the significance of the work performed may be fully realised. After no less than 80½ m.p.h. at Crow Park, and maintaining that speed over the mile on to Carlton. I believe I have had an "eighty" here before, but only once, and with less than than half the load. So we covered the 11·8 miles from Tuxford to Newark in 9 min. 45 sec., at an average speed of 72·6 m.p.h., and passed Newark in the unique time of 19 min. 35 sec. from a dead start at Retford. This would be a noteworthy time for this 18·5 miles' length with a far lighter load, in view of the 5-mile rise out of Retford.

We were now before time, and although Croft, in recognition of this fact, brought

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*P. M. Burnett.*

Leeds express worked by Great Northern three-cylinder 4-6-2 engine No. 1473.

the first quarter-mile or so, commenced as before, the cut-off was brought back to 45 per cent., but the regulator remained nearly fully open. Right up the 1 in 178 and 200 we gathered speed, until we had actually reached 48 m.p.h. at the summit of the climb, with a time of exactly 8 min. for the 4·9 miles. As if to illustrate what has already been said as to the response of the boiler to firing, the pressure rose from 160 lb. at the Retford start to 170 lb. at Markham Summit. Once over the summit, Croft brought his regulator back to three-fifths open, and we accelerated with tremendous rapidity on the falling grades that follow, reaching his reverse back to 40 per cent. at Newark, and his regulator opening back to one-half, and the firing was eased till the pressure dropped back to 140 lb., we were destined to suffer the penalty. A laggard "stopping goods," stowing itself in leisurely fashion into the refuge siding at Claypole, brought us to a dead stand at Balderton Box, just over 3 miles south of Newark; we had covered this distance of 21·7 miles from Retford, start-to-stop, in the brilliant time of 23 min. 25 sec. As the profile shows, it would barely have been possible to select a worse place for stopping us. But, after a stop of 55 sec., we got away well,

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Photo.] LONDON AND NORTH EASTERN RAILWAY. [*Chas. S. Lake.*

Up Leeds express south of Peterborough. Great Northern 4-4-2 locomotive, No. 1412.

accelerating gradually to 55½ m.p.h. up the 1 in 550–330 to Hougham, and then dropping back to 48½ on the 1 in 200 to Peascliffe Tunnel. This was accomplished, after the usual 65 per cent. start, on 45 per cent. all the way up, regulator being kept at three-fifths on the easier part of the climb, and advanced to four-fifths on the 1 in 200. Meanwhile the pressure was slowly advancing from the 140 lb. at which we had been caught on stopping at Balderton to 160 lb. on reaching Grantham; the 11·4 uphill miles were covered in 16 min. 20 sec., start to stop. This train has an additional stop at Newark on Wednesdays, to which our Balderton stop in a measure corresponded, except that the latter occurred in a more difficult location so far as the engine was concerned. Our time from Retford to Grantham was 40 min. 40 sec., and our actual running time 39¾ min.; net time is difficult to estimate, but I should put it at about 36 min., assuming running about equal to, or slightly easier than, that which was made from Retford to Newark.

At Grantham the addition of the Lincoln coach brought the load up to its full figure of 62 axles, or 448 tare tons. The passenger complement had been steadily increasing, and, on leaving Peterborough, the aggregate was 480 tons behind the tender, at the lowest computation; there would be a ton or two less from Grantham. We started from Grantham with 170 lb. of steam, and maintained this figure steadily up to Stoke. Getting away on 65 per cent. and regulator one-fifth less than full open, Croft then brought the former back to 50 per cent., and the latter to three-quarters open, for the rest of the ascent. Thus, although the 1 in 200 starts right off the platform end, we gradually but unceasingly gathered speed, until we breasted Stoke Box at 46 m.p.h., in the magnificent time of 9 min. 10 sec. from the start—a really wonderful feat in consideration of the adverse nature of the start and the 475-ton load. Then Driver Croft and No. 1473 between them contrived to demonstrate that the "Pacifics" yield absolutely nothing to the "Atlantics" in the matter of free running downhill. The speeds are set out in detail in the table. Suffice it to say that we maintained 81·8 m.p.h. for some miles between Little Bytham and Essendine, averaging 81 m.p.h. between these stations and 73·1 m.p.h. over the 20·1 miles from Corby to Westwood Junction, shortly before which point we had shut off steam. So Peterborough was reached in 30 min. 25 sec. for the 29·1 miles, start-to-stop, and 2½ min. of our lost time were regained. The regulator stood at

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about one-half open and the cut-off remained at 45 per cent. from Stoke to Peterborough.

While standing at Peterborough the pressure rose to a shade under 180 lb., although not quite sufficiently for the engine to "blow off." We started up on 65 per cent. cut-off and a four-fifths regulator opening up the 1 in 237 to the Great Eastern Railway bridge, where the cut-off was brought back to 45 per cent. and the regulator to three-fifths. But we did not pick up speed quite so rapidly as was desirable, and round about Yaxley the regulator was opened out to three-quarters, where it remained until half-way up the 1 in 200 of Ripton bank, where Croft finally advanced his opening to four-fifths. The start from Peterborough was the only slight disappointment of this remarkable journey. I rather thought we should have topped the mile-a-minute rate along the Holme "level," whereas the maximum sustained speed here was 59 m.p.h. But we breasted the 4½ miles at 1 in 200 past Ripton finely, maintaining an even 50 m.p.h. for some distance, and only falling finally to 48 m.p.h. at the summit. The pressure was now 170 lb., and ranged between 160 lb. and 170 lb. from Leys Summit through to King's Cross. The cut-off also was never varied from 45 per cent. all the rest of the way to town.

Regulator one-half open took us through Huntingdon at 70½ m.p.h., 80 sec. behind the impossible booked time (with such a load as this) of 20 min. from Peterborough; but some of the finest running of the whole journey was that whereby we regained the last four minutes of arrears between Huntingdon and King's Cross, running this distance of 58·9 miles in 5 sec. over the even hour. From Offord almost until passing Hitchin the regulator was three-fifths open; this sufficed to take us over the 27 miles from Huntingdon to Hitchin in 5 sec. under "even time," despite the fact that the bulk of this distance is against the engine. At Hitchin, Croft opened out to three-quarters, and at Wymondeley Box to four-fifths. The engine responded nobly up the continuous 1 in 200 to Stevenage, maintaining 48 m.p.h. up the last mile. The regulator was then brought back to three-fifths for the undulating stretch on to Woolmer Green, and the same opening was also employed for the climb from Hatfield to Potter's Bar. All the remainder of the journey was made on a one-half opening.

The final dash for home was an exhilarating experience; 15 min. 5 sec. was an exceptional time in the up direction from

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*H. Gordon Tidey.*

Highland express at Perth. North British 4-4-2 engine No. 510, "The Lord Provost."

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Hitchin to Hatfield, and 18 min. 5 sec. in from Hatfield to King's Cross, with a very careful finish from Finsbury Park, was even more notable. Maxima were 74 m.p.h. before Hatfield and 77½ m.p.h. at Wood Green. So we worked this 62-axle train of 480 tons from Peterborough to King's Cross in 81 min. 25 sec. It is astonishing to note that the sum of the Grantham-Peterborough and Peterborough-London times makes a total running time of only 111 min. 50 sec.; consequently, had we not been stopping at Peterborough, the non-stop journey of 105·4 miles from Grantham to King's Cross might have been accomplished in the schedule of the pre-war "698 up"—that racing Manchester and Sheffield express of *four* coaches that was allowed 110 min. for the run! Our times from Grantham were more than 5 min. under those scheduled, and at least 2 min. further would have been gained from Retford to Grantham but for our signal stop at Balderton.

It is instructive to compare the running of No. 1473 with that of "Atlantic" No. 1452, as described in the March issue. With the exception of the Doncaster start, for reasons already explained, the "Pacific" had the advantage at every point, especially on the adverse gradients. It is, of course, a matter for no small surprise that the 4–4–2 could have put up times no nearly approximating to those of the 4–6–2, with an identical load; but, as previously mentioned, an absolutely expert crew alone could have coaxed such work out of an engine of the "Atlantic" type. Furthermore, the latter must have been worked tremendously hard and must have burned a proportionate amount of fuel; whereas, on this journey, as we have clearly seen, the "Pacific" had plenty of power in reserve, and, as for fuel, the driver's rough estimate of 3 tons from Doncaster, which appeared to me fairly correct, would not mean a greater consumption than 43 lb. per mile—a by no means immoderate figure in proportion to the colossal load and high sustained speed. The coal, again, was of unusually poor quality, being fully 25 per cent. slack, in the form of fine dust, vast quantities of which deposited themselves on the exposed parts of our persons until, on arrival at King's Cross, the three of us on the footplate would have been barely recognisable by our dearest friends. But the readiness with which steam was raised on such fuel proved the wisdom of a firegrate having so large an area as 42 sq. ft., which tends to extract the

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Henry L. Salmon.*

Inverness-Perth train near Stanley Junction. Highland 4-6-0 locomotive, No. 35.

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maximum calorific value from any description of fuel.

A final impression of this wonderful machine was the ingenuity with which all the details of a locomotive developing 2,000 h.p. have been bestowed within the exacting limits of the British loading gauge. It seems almost impossible, when standing in the driver's position on the footplate, to realise that one is looking over a boiler whose maximum diameter, at its junction with the firebox, reaches such a figure as 6 ft. 5 in., which has never previously been attained in British practice. For years we have been accustomed to look on a 5 ft. 6 in. boiler as one of large diameter. Yet the look-out is excellent on both sides of the line ahead, and, in comparison with right-hand driving on some of the large Belpaire engines on which I have travelled, where the driver's view is severely limited by the vertical firebox side, the number of occasions on which the fireman was called upon to observe a signal were few indeed. In every detail these engines seem to embody the fruits of years of careful thought and study, based upon the designs which have preceded them on the Great Northern Railway, and Mr. Gresley is to be congratulated on the triumphant success of this his crowning design. One may be permitted to express the hope that, now the precedent has been established of naming the first two engines of the class, it will be extended in order that another may carry the honoured name of the designer.

Before closing this article I wish to describe a couple of Great Northern runs in the reverse direction. The unique interest of the first of them to me lay in the fact that, except for one journey at the time when the 5 p.m. down was piloted daily to Hitchin, this was the first occasion, since Stirling days, on which I had travelled in a piloted Great Northern express. It was the 5.40 p.m. down that figures in the run, owing to a slight mishap to one of the "Pacifics." The load out of King's Cross was the usual 66-axle train, weighing 486 tons empty and 515 tons full, hauled by superheated "Atlantic" No. 1454, with 4-4-0 No. 50 as pilot. There was nothing unusual about the work, however, and to the credit of the "Pacifics" be it said that a passenger in the train would have been quite unaware that one of the latter, unassisted, was not at the head of the train. We passed Finsbury Park in 6 min. 50 sec., got signals badly on at Hadley Wood

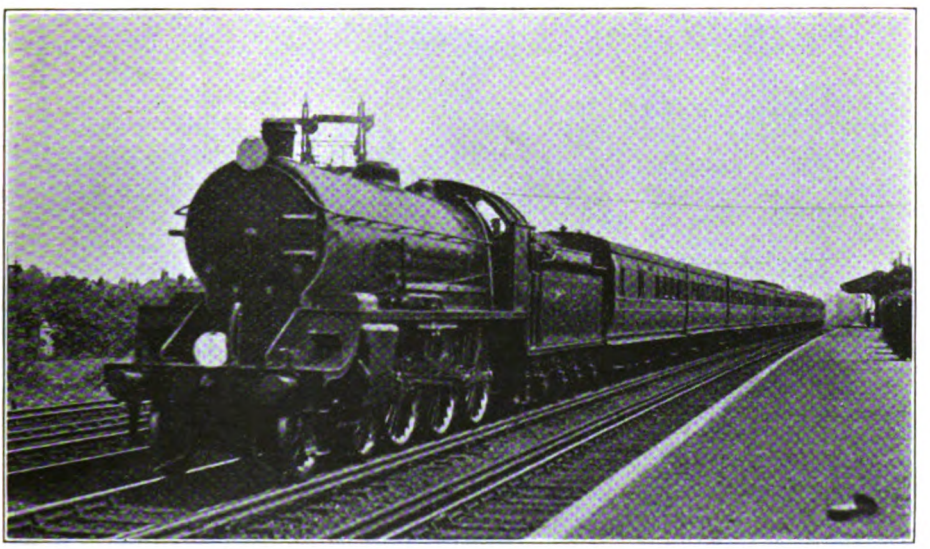

Photo.] SOUTHERN RAILWAY. [*J. F. Dearden.*

Waterloo-West of England express. London and South Western 4-6-0 locomotive No. 736.

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(owing to that troublesome 5.10 p.m. from Broad Street to Potter's Bar, which used to take the main line from New Barnet between the 5.30 and the 5.40, but now starts at 5.7 and has been exalted to the dignity of a non-stop run from Finsbury Park to New Barnet, and so gets clear of the former), passed Potter's Bar in 22 min. 10 sec., Hatfield in 27 min. 40 sec., Hitchin in 42 min. 40 sec., Huntingdon in 66 min. 20 sec., and reached Peterborough in 86 min. 20 sec., or 85 min. net. Maximum speed was 77½ m.p.h. at Three Counties. At Peterborough, No. 50 was exchanged for No. 1335, which, with No. 1454, passed Essendine in 16 min. 40 sec. at 57½ m.p.h., and Stoke in 31 min. 10 sec. at 42½ m.p.h., reaching Grantham in 37¾ min.—a loss of ¾ min., as compared with the previous net gain of 2 min. But brighter work was done north of Grantham, as we passed Newark in 16½ min. and Retford in 34¾ min., having fallen only to 51 m.p.h. at Markham. We should have reached Doncaster in 53 min. from Grantham, but for concluding signal delays, which made the total time 55¾ min.

The other experience was one of quite recent date on the immediately preceding 5.30 p.m. Newcastle express out of King's Cross. Of this the attraction lay in the clear demonstration which it gave of the feasibility of the 205-min. non-stop Leeds timing which is to come into force soon after these lines are in print, the load of the 5.30 on this occasion—274 tons empty and 290 tons full—being almost exactly the figure intended in the case of the new Harrogate Pullman Limited express. My anticipations of something unusual were aroused when I overheard a platform inspector remark to the driver, just before starting: "You haven't been long on 'Atlantics,' have you?" No. 1442 was the engine, and the halcyon days of Harry Warren, who drove it for so long, were recalled by this run.

Photo.] GREAT SOUTHERN AND WESTERN RAILWAY, IRELAND [*Rex Murphy.*

Up English mail train on heavy grade between Cork and Blarney.
Pilot engine, old 0-6-0 No. 130. Train engine, four-cylinder 4-6-0, No. 402.

We got through Finsbury Park briskly in 6 min. 35 sec., passed Wood Green at 57 m.p.h., and Potter's Bar at 45½ m.p.h., in 19¼ min. There was a slight check just before Hatfield, which we got through in 24¾ min., and this affected our time of 32 min. 55 sec. to Knebworth to the tune of about a minute. Hitchin was passed in 39 min. 20 sec., and we ran the 27 miles from there to Huntingdon in 23 min. 35 sec., with a maximum of 80½ m.p.h., and a well-sustained rate of 79 near Three Counties. So we passed Sandy in 49¼ min., Huntingdon in

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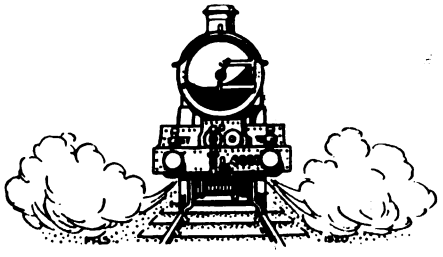
62 min. 55 sec., Abbot's Ripton in 68¼ min., Holme in 73 min. 25 sec., and Yaxley in 76 min. 20 sec. (72·6 miles), or 75¼ min. net. Obviously this meant a possible time of just over 79 min. to Peterborough, but our driver appeared now to awaken to the fact that he was getting well before time, and so reduced his speed to the merest crawl, and instead we took 82 min. 10 sec. to the centre of Peterborough station, which we passed at about 10 m.p.h.

Then we got going again in great style, getting over Werrington Junction in 87¾ min., and attaining a level 67 an hour on the gradual rise from Tallington to Essendine, which we passed in 96 min. 25 sec.; at Little Bytham, passed in 100 min. 5 sec., we were still travelling at 60 m.p.h., and at Corby, passed in 105¾ min., 50 m.p.h. We were slightly eased on the final 1 in 178 to Stoke, however, falling to 40½ m.p.h., and passing the summit in 109 min. 50 sec. Then followed another abject crawl down to Grantham, whereby the driver, by the plentiful assistance of his brakes, managed to spin out 8¼ min. over these 5·4 downhill miles. Even so, we had run down from London in 118 min. 5 sec., or 117 min. net (the pre-war time), as against the allowance of 121 min. With normal running from Yaxley to Peterborough and again from Stoke to Grantham, our net time would have been nothing more than 113 min. from London.

Better still was to follow. No. 1446 now came on to the train, and electrified me by attaining 79 m.p.h. at Claypole, passing Hougham in 8 min. 20 sec., Newark in 15 min. exactly, Crow Park, 21·9 miles, in 21 min. 20 sec.—under "even time"—still at 65 m.p.h., Markham Summit in 28¼ min., at 52 m.p.h., Retford in 32 min. 55 sec. (having touched 74 an hour in descending from Markham), Bawtry in 41 min. 5 sec.—we maintained 69 to 67 m.p.h. all the way from Retford to Bawtry—and Piper's Wood, 44 miles, in 43 min., at 51 m.p.h. Then the engine was materially eased, but still we contrived to get through Doncaster in 50¼ min., actual time—instead of the 55 min. allowed—and Selby, at greatly reduced speed, in 70 min. 35 sec. for the 69·7 miles from Grantham. We could have reached York with the utmost comfort in 89 min. at the most, whereas this train is allowed 95 min. from Grantham, but again a laggard goods was allowed to obstruct our path, and while shunting at Escrick brought us to a dead stand at Riccall. So our actual time to York was 96 min. 20 sec., which was a poor sequel to the driver's fine effort. No previous communication had been made to either driver on this run. The moral of the trip was that, with a net time of 113 min. to Grantham and an actual time of just over 50 min. from Grantham to passing Doncaster, the booking of the new "flier" through Doncaster in 165 min. from King's Cross, as will probably be necessitated by the allowance of 205 min. to Leeds, will present not the slightest difficulty to an "Atlantic" with a 290-ton load, and will, indeed, leave a margin—on such showing as this—of fully 5 min. in hand as far as Doncaster with which to meet any signal or other *en route* delays.



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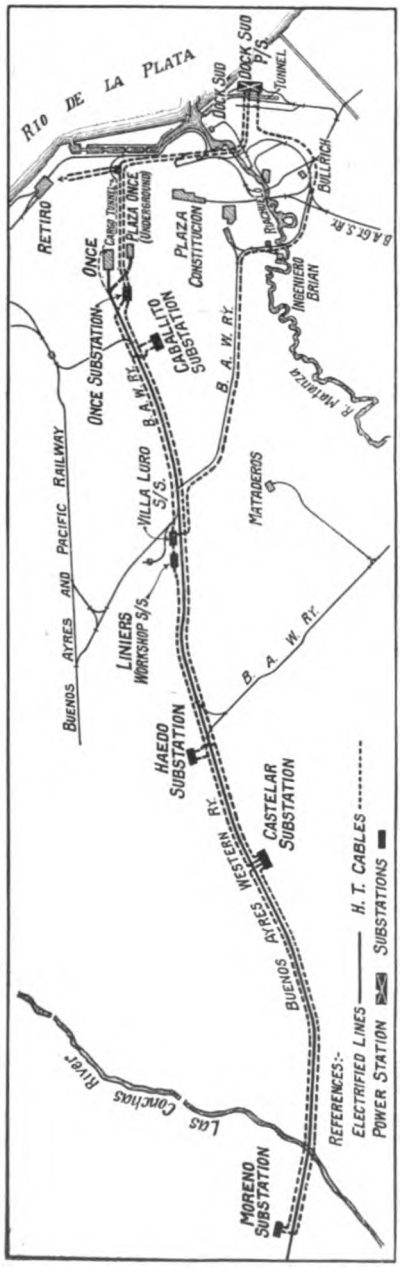
Suburban Railway Electrification in the Argentine.

EQUIPMENT OF BUENOS AYRES WESTERN RAILWAY LINES.



MAP SHOWING LINES ELECTRIFIED WITH 20,000-VOLT FEEDERS, TOGETHER WITH POWER AND SUB-STATION SITES.

ON April 30 His Excellency the President of the Argentine Republic, Dr. Marcelo T. de Alvear, inaugurated an electric service on the suburban lines of the Buenos Ayres Western Railway. This railway, which has a mileage of 1,882, is one of the great British-owned systems in the Argentine, and extends from Buenos Ayres to the foot of the Andes. It includes the oldest railway in the Argentine, having been inaugurated in 1857. The system was operated by the Government until July 1, 1890, when it was purchased by the Buenos Ayres Western Railway Company.

Freight traffic on the Western Railway consists mainly of wheat, maize and general merchandise. Passenger traffic during the twelve months ending June, 1922, amounted to 11,000,000; of these, 9,000,000 were carried on the section serving the suburbs of Buenos Ayres. This indicates the extent to which the population of the Argentine is concentrated in that city, which now contains about 1¾ million inhabitants—almost one-fourth of the population of the country. The congestion and the value of the land in the centre of the city have for some years exerted a great and growing pressure to increase the extent and the population of the suburbs, and this pressure has, if anything, been intensified by the conditions arising from the war, so that traffic on all the suburban lines is now increasing rapidly.

From the map reproduced it will be seen how the four great British-owned railways which have their headquarters in Buenos Ayres serve different sections of the suburbs. The Central Argentine Railway, which serves the northern district as far as Tigre River, commenced an electric service on the Tigre lines in the year 1916. The Buenos Ayres and Pacific Railway runs through Palomar and Hurlingham; the Buenos Ayres Western

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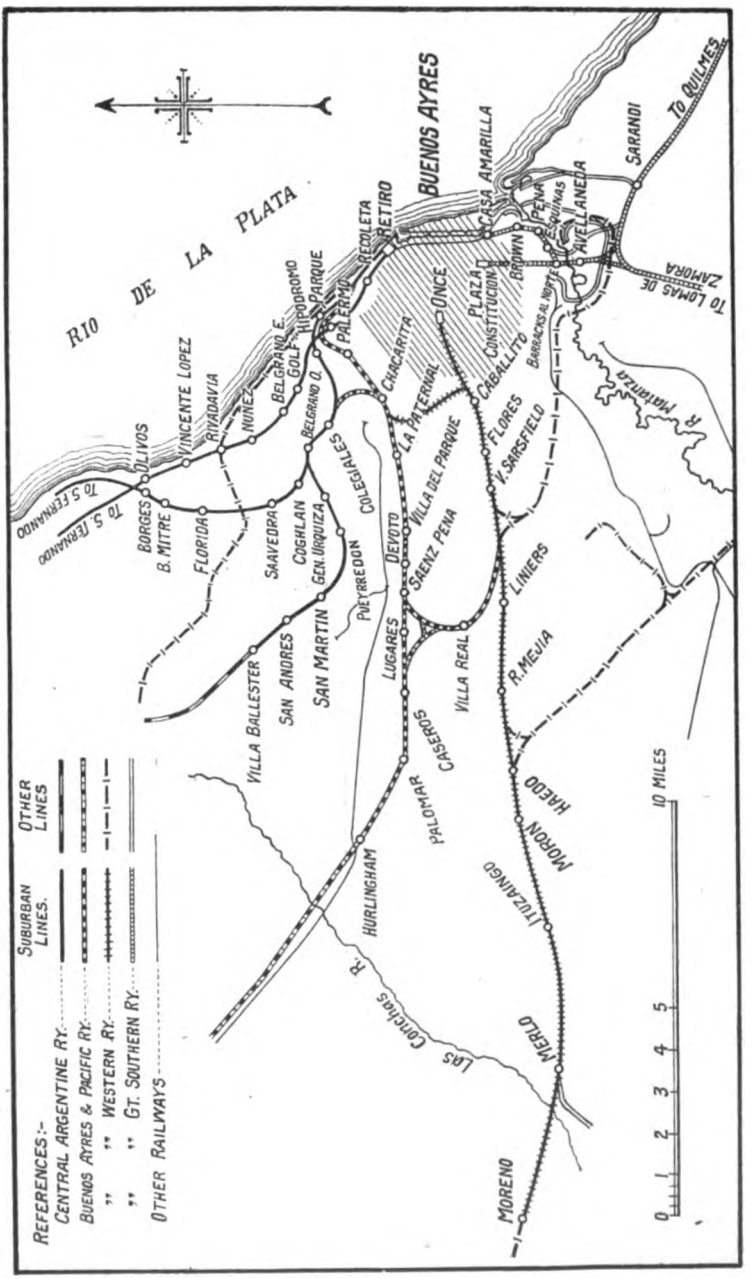
Railway runs due west through Liniers, Moron, and Moreno; the Buenos Ayres Great Southern Railway serves the southern suburbs out towards La Plata and Burzaco. The termini of these railways are all some distance from the centre of the city, and are linked up by a comprehensive tramway system. Urban traffic is also catered for by the Subterraneo of the Anglo-Argentine tramways, an underground system which extends from the Government House to Plaza Once and onward to Flores on the Buenos Ayres Western Railway. It was in order to facilitate transhipment of passengers that the railway arranged with the Anglo-Argentine Company to establish a joint underground station beneath Plaza Once, near their main terminal station, Once, and to run their suburban trains from this station.

On May 1, 1923, the company began running electric trains in combination with the trains of the Anglo-Argentine Subterraneo, and through tickets are now issued from the suburbs on the Western line to any station on the Subterraneo between Once and Plaza de Mayo. This scheme of intercommunication was one of the considerations which turned the attention of the railway company's London Board to the question of electrification, and led them, in 1912, to obtain from Merz and McLellan, of Westminster, a report upon the electrification of their suburban lines. Work was commenced in 1913 under the supervision of the above-mentioned firm, and Livesey, Son and Henderson,



MAP SHOWING BUENOS AYRES SUBURBAN LINES.

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STANDARD SIX-COACH SUBURBAN TRAIN.

consulting engineers, but the outbreak of war, and the difficulties which the various contractors experienced in fulfilling their obligations, resulted in the work being practically suspended for a number of years. On the conclusion of hostilities progress was resumed, and on October 16, 1922, the first electric passenger train was run between Once (High Level) station and Castelar, the end of the second zone of the Western suburban line.

Since that date, as rolling-stock became available, more and more of the suburban traffic has been handled electrically, and on May 1 the full service commenced running from the joint underground station below Plaza Once. In addition to the electric passenger train service a portion of the freight service is handled electrically, the railway company having constructed a tunnel between Once and the port of Buenos Ayres. This tunnel is 5·1 km. long.

The complete electrification works for the suburban system include a power station of 25,000 kw. capacity, 72·5 miles, of high-tension cables, four traction sub-stations with 15,000 kw. of converting plant and the electrical equipment of 70 miles of single track. In addition the supply of power and lighting calls for transforming plant to the extent of 7,000 kw., this being distributed over the system in four static sub-stations and two of the traction sub-stations. Power is produced in the generating station as three-phase current at 20,000 volts, with a periodicity of 25 cycles transmitted to sub-stations, converted to direct current at 800 volts, and supplied to the electric trains through a third rail. At the port and in goods sidings to be electrified in the future, overhead electrical equipment of the track has been installed. The whole of the apparatus used in connection with the electrification was manufactured in Great Britain. The foundations for the power station and walling, together with complete erection of the main switch house, sub-stations, excavation for cables and the erection of the third rail and overhead equipment in the port lands were carried out by the railway company with their own staff.

The power station is at Dock Sud. This is somewhat remote from the railway, but the advantages of this site greatly

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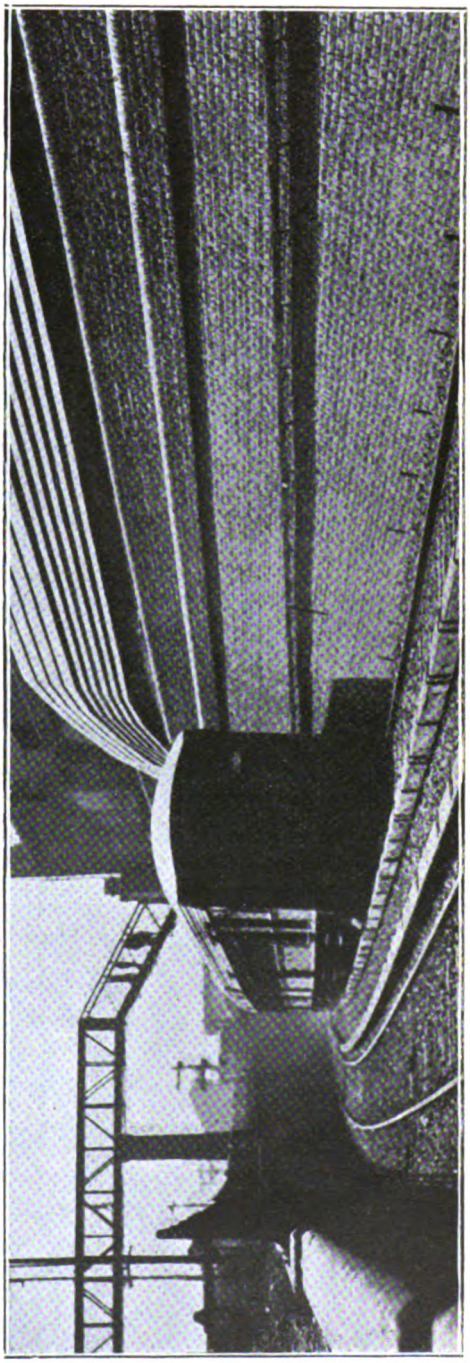
outweigh the minor disadvantage. The station is situated on the strip of land between Dock Sud and the River Plate, enabling circulating water for the condensers to be drawn from the dock and discharged into the river, so that an unlimited supply of cold water is always assured.

There are seven Babcock and Wilcox boilers of 9,072 kw. capacity, originally supplied for burning coal, but since converted to burn petroleum. The generator room contains three turbine alternator sets built by the Metropolitan-Vickers Electrical Company. Each generator runs at 1,500 r.p.m., and has a capacity of 6,200 kw. at its most efficient load. The generators are specially designed for heavy traction work and have an overload capacity of 9,000 kw. for 30 min. and 11,000 kw. for 40 secs. The generators are directly connected to a group of three single-phase 25-cycle transformers wound for 2,500 volts on the primary and stepping up to 20,000 volts on the secondary.

The whole of the control switchboard is designed for a working pressure of 20,000 volts. The neutral point of the step-up transformers is connected to earth through a grid resistance through an oil switch. The motors for driving the auxiliaries of each generator are fed from a 375-k.v.a. transformer at 440 volts three-phase, this transformer being connected to the 2,500-volt terminals of the generator. In addition, two 20,000/440-volt three-phase transformers of 1,250 k.v.a. capacity are provided for supplying the other motors of the power station.

Distribution to the various sub-stations is carried out by means of underground cables, of which there are three.

The traction sub-stations are four in number, situated at Once, Villa Luro, Castelar and Moreno. These sub-stations are designed to take the 20,000-volt current supplied from the power station and convert the same into 8,000-volt direct current for supply to the track. The machinery for making this conversion consists of ten rotary converter sets, three of which are in Once sub-station, three in Villa Luro sub-station, two in Castelar and two in Moreno. Each rotary converter set consists of a group of three single-phase transformers having a ratio of 20,000/625 volts. Tappings are provided to



ELECTRIC TRAIN ON 1 IN 40 GRADIENT FROM PLAZA ONCE STATION

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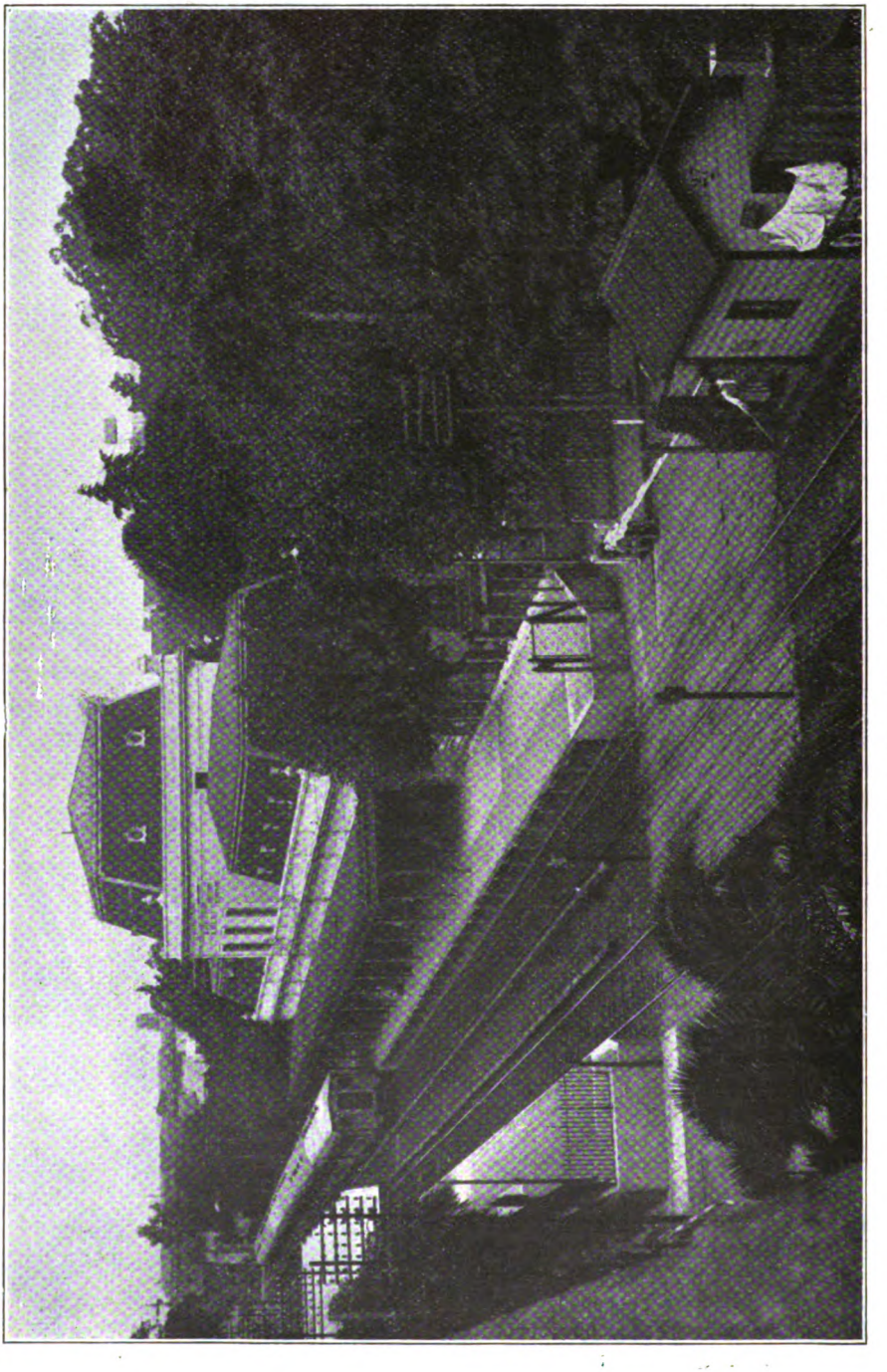

ELECTRIC TRAIN AT FLORES STATION, BUENOS AYRES WESTERN RAILWAY.

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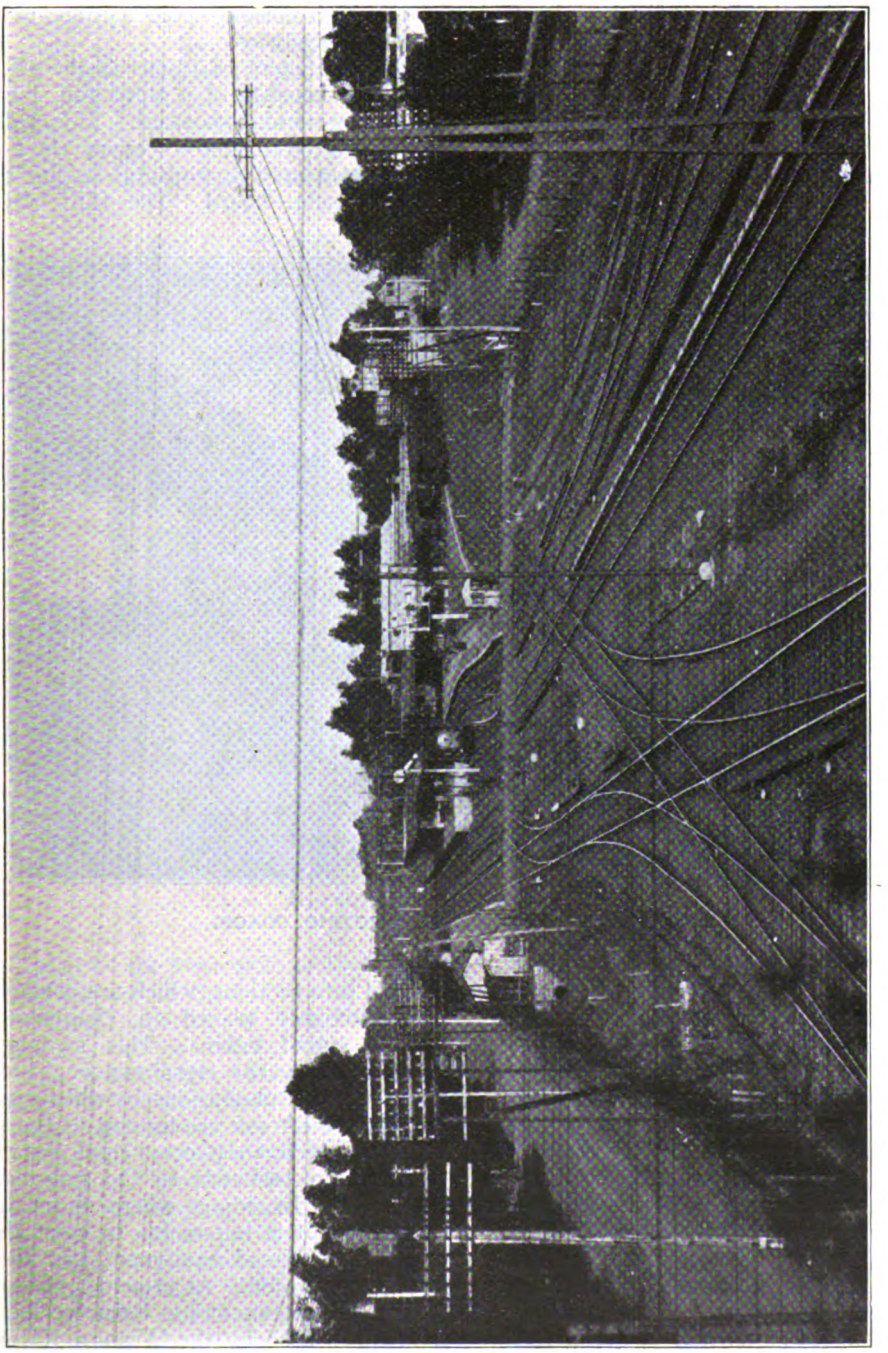

TRACK LAY-OUT AT HAEDO STATION, SHOWING (ON RIGHT) ELECTRIFIED LINES.

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compensate for drop in feeder voltage. The rotary converters are of the six-phase 10-pole type, designed for a normal load of 1,000 kw. They have a large overload capacity, viz., 2,000 kw. for 10 min. and 3,000 kw. momentarily.

The Once sub-station contains also three sets of motor-generators, 150 kw. capacity each, for supplying direct current for the lighting and power installation of the Once terminal station. There are also two 5-kw. motor generators for supplying single-phase current, for the direct circuiting in connection with the signalling at Plaza Once station. In Villa Luro sub-station there are two 800-kw. frequency-changer motor-generator sets for supplying 50-cycle 440-volt three-phase current for the railway workshops. In addition to the four traction sub-stations already mentioned, three static sub-stations have been built, for supplying current to the power and lighting installations in Caballito yard, Liniers shops and Haedo yard.

As a supply of current is given to the Buenos Ayres Great Southern Railway, a static sub-station has also been built at their Km. 5 yard, and one of the Western Railway feeders is connected thereto. This sub-station is equipped with step-down transformers having a ratio of 20,000/6,600 volts, which is the voltage of the high-tension cable system of the Southern Railway.

The equipment of tracks in the electrified zone consists of a third rail, having an under-running contact. This rail is supported on insulators every three m., and is protected on top and behind by a 1-in. lapacho board. The third rail is divided into sections, which are controlled by switchgear placed in chambers in various signal cabins. This switchgear is operated by the signalmen on instructions from the sub-stations, by which means faults on the track are limited to the section in which they occur and entail a minimum disturbance to the running of the trains. In sidings where shunting is carried on, it is impossible to erect third rail, and overhead equipment has therefore been adopted. At present, only some 10 km. of equipment has been erected in the sidings used by the Western Railway in the port of Buenos Ayres.

Passenger rolling-stock consists of 47 motor coaches and 45 trailer coaches, all

INTERIOR OF FIRST-CLASS ELECTRIC COACH.

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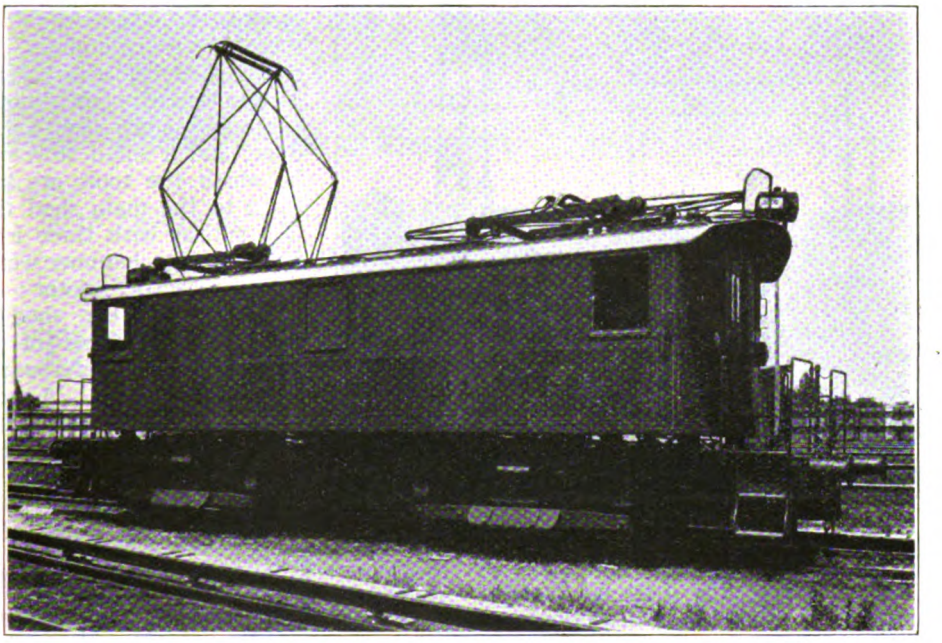
equipped on the multiple-unit system. The motor coaches have a motorman's compartment at each end, whereas the trailer coaches have a motorman's compartment at one side only. The motor coaches are equipped with four motors of 200 h.p., 670 r.p.m., having a gear ratio of 3.42/1. The diameter of the driving wheels is 3 ft. 6 in., and vacuum brake equipment is used with a motor driven vacuum pump. The whole electrical equipment for the rolling-stock has been supplied by the American Westinghouse Company, the body work of the locomotive being made by the Baldwin Locomotive Works. The control equipment is of the Westinghouse electric pneumatic type. Each locomotive is equipped with four motors of 230 h.p. each, capable of giving a total pull of 10,000 pounds at starting. The gear ratio is 3·88/1, and the diameter of the wheels is 4 ft. These locomotives are equipped with pantographs for collecting



ELECTRIC FREIGHT LOCOMOTIVE.

supplied by the Metropolitan-Vickers Electrical Export Co. Ltd.

Seating capacity of the coaches is: first-class motor coach, 64; first-class trailer coach, 68; second-class motor coach, 88; second-class trailer coach, 69. The motor coaches are 62 ft. long over buffers, and the trailer coaches 63 ft. 4 in. In order to provide easy entrance and exit of passengers from the coaches, two double doors are provided on each side. No steps are required as all the suburban section platforms served by the electric trains have been raised to a height of 1·10 m. above the rail level.

There are also two electric locomotives current from the overhead equipment, and also with collecting shoes for making contact with the third rail. Their brake equipment is the standard Westinghouse compressed air design, the air pressure being supplied by a motor-driven air compressor, which also supplies compressed air for operating the equipment. The total weight of each locomotive is 62½ tons.

The car inspection and repair sheds are situated at Villa Luro, and consist of two inspection sheds, capable of housing 64 coaches on eight tracks. The floor of this shed is sunk below the level of the tracks, so that the examiners can walk at full height underneath the coaches and carry

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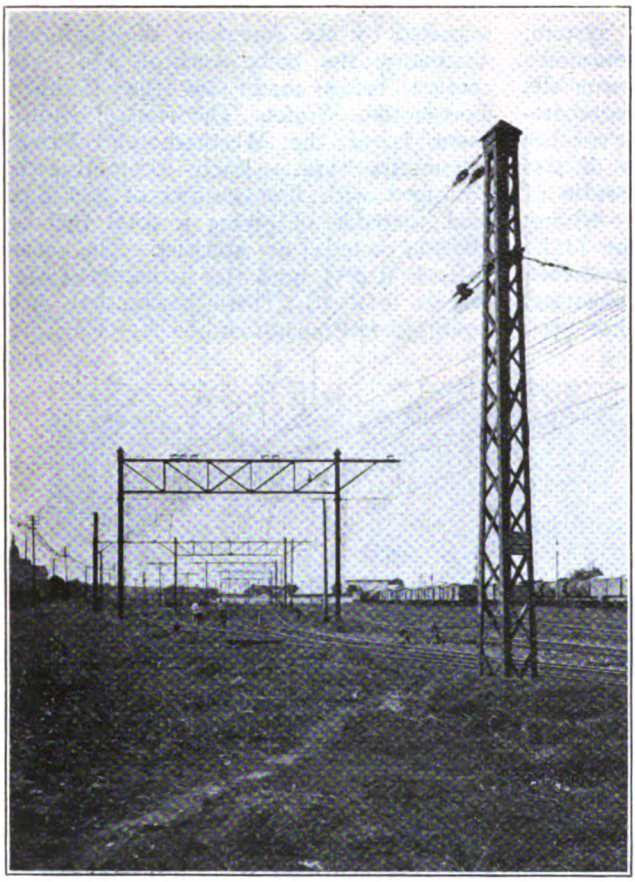

OVERHEAD LINE EQUIPMENT ON PORT SIDINGS.

The repair shed consists of two sections. The first section has room for nine coaches and is equipped with two electric cranes for lifting the framework of the coaches when changing the bogies. The other section of this shed contains the machinery for effecting repairs to axles, wheels, &c., and has one electric crane, this crane being used for the purpose of moving motors, axles, &c., among the machinery whenever repairs thereto are required. The repair shed has also a small section where repairs to motors, contactors, controllers, &c., are done, and a small store-room in which the tools are kept. Close to the main shed there is a smithy with three forges and a sledge hammer worked by an electric motor; and alongside the car shed are situated the offices of this shed, as also a storeroom for electrical materials. A second small inspection shed is situated at Caballito station, at which point a number of the electric trains are stored during the slack hours of the day.

out their work in the most comfortable manner. For the washing of windows and the outside of coaches, a gangway is provided at coach floor level. These gangways extend the whole length of the sheds, there being one on either side of each track. As it is impossible to carry the third rail into this shed, in order to provide current for moving trains therein, each track is provided with an overhead wire trolley from which hangs an insulated trailing cable which can be plugged into the power receptacles of any coach.

The opening ceremony on April 30 was attended by a large and distinguished company, including the President of the Republic, Dr. M. T. de Alvear, and nearly all his Cabinet Ministers, Dr. J. L. Cantilo, Governor of the Province of Buenos Ayres, and other notable national and provincial authorities. The Buenos Ayres Western Railway was represented by Sir Henry Bell and Sir Albert Bowen; Dr. G. E. Leguizamon of the Local Board, Mr. Frank Foster (General Manager), Mr. W. Lowe Brown (Assistant General Manager) and all the chiefs of departments.

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Photo.] [*E. S. Hallett.*

DOWN "SOUTHERN BELLE" PULLMAN CAR EXPRESS NEAR PRESTON PARK.

Superheater 4-4-2 locomotive, No. 426.

The "Brighton" Main Line, 1898 to 1922: A Retrospect. [No. I.]

By MAJOR H. MYERS.

MANY readers of the RAILWAY MAGAZINE must be included among the millions of passengers who have had occasion, during the past quarter of a century, to use the London, Brighton and South Coast Railway's main line. To such, a survey of his experiences by a constant traveller throughout that period cannot fail to be of interest. Other readers not personally acquainted with the system may derive fresh insight into the local difficulties and problems, and how these are met and solved.

The period 1898–1922 covers the entire evolution of the present ample, comfortable and speedy train service from one to which none of those adjectives could be applied with strict truth. The 1898 service between London and Brighton may have been sufficient so far as concerned the number of trains: but its speed was very poor indeed. Admittedly the best timing of 65 min. was respectable; its hoary antiquity (it was born in 1857) entitled it to veneration; but it applied to one train only, in one direction only, and first class only, except on Saturdays, when all classes were conveyed. The demand for a Saturday down express at 5 p.m. being virtually nil, this concession to "seconds" and "thirds" was of no great value. With this solitary exception no week-day train ran in either direction in less than 70 min., and even 80-min trains were treated as crack expresses, most of them barred to the hapless third-class passenger. No down morning train took less than 80 min., no up train after 5.45 less than 88. A Brightonian who had to be in London by 10 a.m. could only do so by leaving Brighton at 7.30, unless the 7.45 a.m. stopping train due into London Bridge at 9.42 be regarded as just "saving its bacon"—but in 1898 one could not get far from London Bridge in 18 min. On the great systems running north and west from London a general improvement

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in express speed had begun long before 1898, but the placid amble of the Brighton trains had not been goaded even to a jogtrot.

Despite these discouraging conditions, the admirable locomotives provided by that great but little-appreciated engineer, the late William Stroudley, had opportunities of showing their abilities. Naturally they had little to do when the road was clear; but, fortunately for the student of locomotive performance, it hardly ever was. The line was persistently overcrowded, there was scarcely any four-track road—none at all outside the London suburbs—while as for the delays round Redhill, Mr. Ahrons' graphic and humorous account in the RAILWAY MAGAZINE (January to April, 1919) will be fresh in the reader's recollection. That the general punctuality of the London-Brighton service was good is admitted, and this fact says much for the engines and their drivers. It must be remembered, too, that even in 1898 Mr. Stroudley's latest design for express duty was already 16 years old; to show that it had proved adequate it is enough to mention that no other engines for main-line expresses had yet been built by his successor, the late Mr. R. J. Billinton.

Happily 1898 saw the end of the epoch of utter stagnation. During the next year there was a modest, but fairly general, acceleration. This consisted largely in cutting out stops, but the point-to-point speeds also showed some improvement, and although the best time for the complete journey remained at 65 min., a new booking of 66 min. from Brighton to Grosvenor Road ran the old 5 p.m. pretty close. The poor third-class traveller was still treated as an outcast, and to save repetition it may as well be said at once that he was kept in that state until "seconds" were abolished. Oddly enough, this penalising of the third-class was confined to the Brighton service, and was not attempted in the trains to and from Portsmouth, Tunbridge Wells or Eastbourne. The last-named two resorts prided themselves on being more "exclusive" than Brighton; which made the oddity all the more odd! To be quite fair, however irritating the injustice may have been, the actual hardship was less than it appeared, the second-class fares being uncommonly low: the difference between single third and second was, in point of fact, 9½d.

Main-line rolling-stock in 1898 was certainly adequate and not actually uncomfortable, but the proportion of bogie

Photo.] **UP HASTINGS TRAIN, SHOWING OLD HEAD CODE.** [*E. S. Hallett.*

0-4-2 locomotive, No. 179.

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coaches was not high, and most of them were firsts or first and second composites. Bogie thirds, however, had begun to appear. Except for a few experimental electrically-lighted vehicles, all stock used on expresses was lighted by gas—not at all badly for those days—*but* (a huge "but") none of it was warmed in any way, save only the Pullman cars.

Some of the improvements of 1898-9 failed to "stay," several trains—mostly the more leisurely—quietly resuming the minutes of which they had been robbed. This regrettable backsliding coincided with the departure of Mr. J. F. S. Gooday, then past Three Bridges to Balcombe Tunnel Box, 31¾ miles from London.

With the exception of one or two additional trains, the main-line service remained substantially unaltered for several years after the mild upheaval of 1898-9 and the subsequent partial reflux. In 1906 a badly-needed new train in each direction was instituted, leaving Brighton for Victoria at 8.10 a.m. and returning at 6.15 p.m. All classes were carried by these trains, which at first took 70 min. for the journey. Soon afterwards, however, the down train was altered to start at 6.35 and accelerated to 65 min.; thus it just

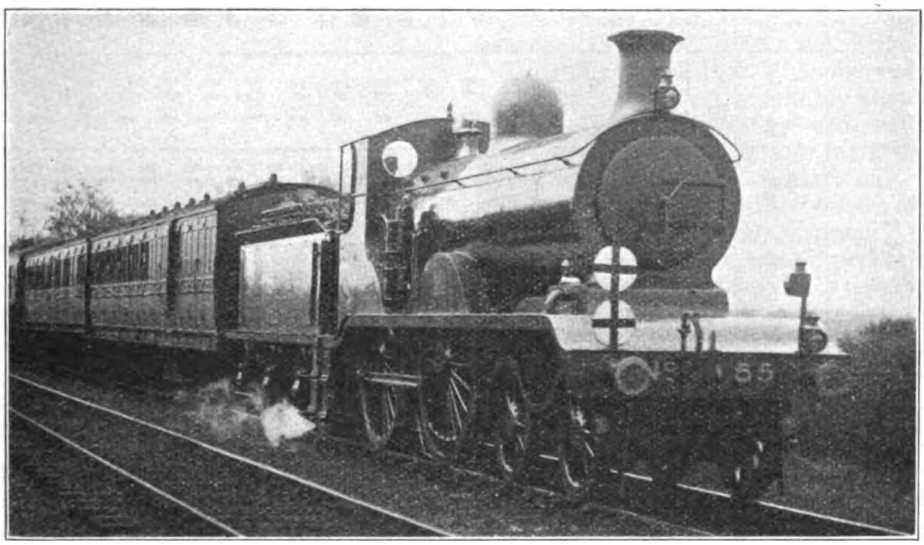

Photo.] [*E. S. Hallett.*

UP TRAIN NEAR WIVELSFIELD, SHOWING OLD HEAD CODE.

4-4-0 locomotive, No. 55, before rebuilding.

General Manager, who went to the Great Eastern Railway in a similar capacity: but whether the sequence of events was in the nature of "cause and effect" cannot be said. There was no tampering with the faster trains, and, what was still better, the all-round smartening in the traffic working was maintained. Punctuality was enormously assisted by the opening in 1900 of the Redhill avoiding line, which gave the Brighton expresses an "all-Brighton" route, and removed stopping trains from the "fast roads" for a distance of 6¾ miles. The doubling of the line southwards from Earlswood was next taken in hand, and eventually extended headed the aged 5 p.m. which took the same time for a quarter-of-a-mile less.

Before quitting the "old era," reference must be made to an incidental curiosity in the way of tickets. Cheap day fares were in operation from either end of the line by several trains, some of which carried "thirds." These tickets were available to return by any train, the fares being 5s. 4d. third, 5s. 8d. second. If the holder of a third wished to return second—as he often did owing to lack of third-class expresses—he surrendered at the booking office the return half of his ticket, together with one-half the difference between the return fares, namely, 2d. He was there-

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FASTEST TIMES WITH VARIOUS CLASSES OF ENGINES, VICTORIA TO BRIGHTON.

	Stroudley designs.		4-4-0		4-4-2 T		4-4-2		4-6-2 T and 4-6-4 T		All classes.	
	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Victoria .. .. .. start		0.00		0.00		0.00		0.00		0.00		0.00
	1.46		1.52		1.50		1.53		1.54		1.46	
Grosvenor Road Box .. pass		1.46		1.52		1.50		1.53		1.54		1.46
	0.51		1.00		0.59		0.57		1.03		0.51	
Battersea Park .. .. ,,		2.37		2.52		2.49		2.50		2.57		2.37
	1.51		1.54		1.58		1.58		2.02		1.51	
Clapham Junction.. .. ,,		4.28		4.46		4.47		4.48		4.59		4.28
	1.32		1.39		1.43		1.41		1.41		1.32	
Wandsworth Common .. ,,		6.00		6.25		6.30		6.29		6.40		6.00
	0.43		0.46		0.46		0.45		0.45		0.43	
Balham .. .. .. ,,		6.43		7.11		7.16		7.14		7.25		6.43
	2.17		2.12		2.11		2.16		2.19		2.11	
Streatham Common .. ,,		9.00		9.23		9.27		9.30		9.44		8.54
	0.56		0.56		0.55		0.55		0.56		0.55	
Norbury .. .. .. ,,		9.56		10.19		10.22		10.25		10.40		9.49
	1.25		1.19		1.18		1.17		1.17		1.17	
Thornton Heath .. .. ,,		11.21		11.38		11.40		11.42		11.57		11.06
	0.53		0.49		0.49		0.47		0.49		0.47	
Selhurst .. .. .. ,,		12.14		12.27		12.29		12.29		12.46		11.53
	1.30		1.16		1.19		1.12		1.15		1.12	
Croydon (East) .. .. ,,		13.44		13.43		13.48		13.41		14.01		13.05
	1.09		1.00		1.03		1.02		1.02		1.00	
Croydon (South .. .. ,,		14.53		14.43		14.51		14.43		15.03		14.05
	1.29		1.15		1.22		1.15		1.15		1.15	
Purley Oaks .. .. ,,		16.22		15.58		16.13		15.58		16.18		15.20
	1.12		1.02		1.04		1.00		1.00		1.00	
Purley .. .. .. ,,		17.34		17.00		17.17		16.58		17.18		16.20
	1.48		1.37		1.40		1.33		1.34		1.33	
Coulsdon .. .. .. ,,		19.22		18.37		18.57		18.31		18.52		17.53
	3.15		2.54		2.55		2.54		2.59		2.54	
Milepost 17¼ .. .. ,,		22.37		21.31		21.52		21.25		21.51		20.47
	1.46		1.32		1.23		1.26		1.33		1.23	
Quarry Box .. .. ,,		24.23		23.03		23.15		22.51		23.24		22.10
	2.58		2.49		2.45		2.39		2.48		2.39	
Earlswood .. .. .. ,,		27.21		25.52		26.00		25.30		26.12		24.49

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Horley ..	..	..	..	3.42	31.03	3.29	29.21	3.28	29.28	3.16	28.46	3.30	29.42	3.16	28.05
			,,	3.21	34.24	3.13	32.34	3.11	32.39	2.55	31.41	3.16	32.58	2.55	31.00
Three Bridges	..	..	,,	2.39	37.03	2.38	35.12	2.33	35.12	2.22	34.03	2.36	35.34	2.22	33.22
Milepost 31¼	..	..	,,	2.05	39.08	2.00	37.12	1.58	37.10	1.47	35.50	2.02	37.36	1.47	35.09
Balcombe ..	..	..	,,	3.29	42.37	3.16	40.28	3.24	40.34	3.05	38.55	3.23	40.59	3.05	38.14
Haywards Heath ..	..	..	,,	2.29	45.06	2.26	42.54	2.38	43.12	2.27	41.22	2.37	43.36	2.26	40.40
Keymer Junction ..	..	..	,,	2.12	47.18	2.14	45.08	2.20	45.32	2.22	43.44	2.22	45.58	2.12	42.52
Hassocks ..	..	..	,,	2.33	49.51	2.19	47.27	2.30	48.02	2.32	46.16	2.30	48.28	2.19	45.11
Milepost 46..	..	..	,,	3.07	52.58	3.00	50.27	3.02	51.04	3.02	49.18	3.09	51.37	3.00	48.11
Preston Park	..	..	,,	1.58	54.56	1.48	52.15	2.02	53.06	2.08	51.26	2.14	53.51	1.48	49.59
Brighton ..	..	..	stop												

upon presented with a full-sized single ticket of the same appearance as an ordinary "second single," but bearing the astonishing legend "London to Brighton" (or "Brighton to London") "second class —2d." I regret my inability to keep one of these tickets; doubtless some enthusiastic collector of railway curiosities possesses one, and, indeed, I have an idea one was illustrated in the RAILWAY MAGAZINE years ago, though I cannot trace the reference.

Locomotive performance under the old bookings had little chance of brilliancy, but it was consistently adequate and even enterprising. Although the 33 large 4-4-0 engines of the "Empress" class came out between 1899 and 1902, the Stroudley "Gladstones" still took a big share of the main-line traffic, and admirably they did it—reliably, economically, and without fuss. Any observer felt safe for a sound run if a "Gladstone" backed on. The same could not be said of the 4-4-0's of the earlier and smaller "Duncannon" type (1895–7) for they were erratic performers, and even when doing reasonably good work appeared to be labouring. They, however, had been built, not for the main line, but to supplant the little Stroudley singles on the lighter trains running on the Portsmouth and Hastings roads. Whatever the cause, their inferiority to the "Gladstones" was far greater than could be accounted for by the differences in dimensions. The bigger-boilered variant, No. 213 "Bessemer," was a good machine, probably she benefited as much from increased adhesion weight as from enhanced steaming capacity. The "Empresses" were very fine engines for their day, and at first had but little work worthy of them; moreover, they compared unfavourably with the "Gladstones" on the score of economy. All classes had at times to tackle very heavy loads, especially on the old 3.40 p.m. from Brighton, which not infrequently totalled a 12-wheeled Pullman and 12 8-wheelers, plus one or two six-wheeled brakes. For a long while this train was regularly "Gladstone"-hauled, with perfect success, albeit a train-load amounting to *nine* times the weight of the engine was no joke, even on a booking of 56 min. (43·3 m.p.h.) to East Croydon. My records contain five runs on this particular train

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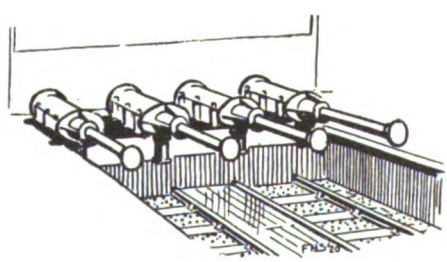
Photo.] VICTORIA—BRIGHTON EXPRESS IN BRAPOOL CUTTING. [*E. S. Hallett.*

4-4-2 tank engine, No. 28.

with " Gladstones " hauling loads of from 300 to 365 tons, and in every instance time was gained by the locomotive, the smallest net gain being one minute. The 300-ton train was so well within the powers of the engine that we ran to Croydon in 50 min. 39 sec. (47·8 m.p.h.) and had we not eased on passing the summit at milepost 17¼, the run could have been completed easily inside 50 min. Intermediate passing times were ; milepost 46 (4·7 miles, all uphill), 9 min. 17 sec. ; Keymer Junction (9·8 miles), 15 min. 10 sec. ; Three Bridges (21·4 miles), 28 min. 39 sec. ; and Quarry Box (32·1 miles), 40 min. 22 sec. Maximum and minimum speeds were as follows : at the 46th milepost (up 1 in 264), 39 m.p.h. ; at Wivelsfield, 64 ; at Balcombe Summit, after 8½ miles uphill, mostly at 1 in 264, 44 m.p.h. ; at Horley, 65 ; and through Quarry Tunnel (up 1 in 206), 40. Down the final seven-mile drop past Purley we never touched 60. The opportunity of regaining time, afforded by a slightly late start from Brighton, was evidently welcomed by the driver, who brought his train into Croydon several minutes early, though he had no idea he was being " clocked." But what a performance for a 38-ton engine hauling 300 tons ! On a basis of " power for weight " the equivalent load for a Great Western " Star " or " Princess " would be 595 tons.

(*To be continued.*)



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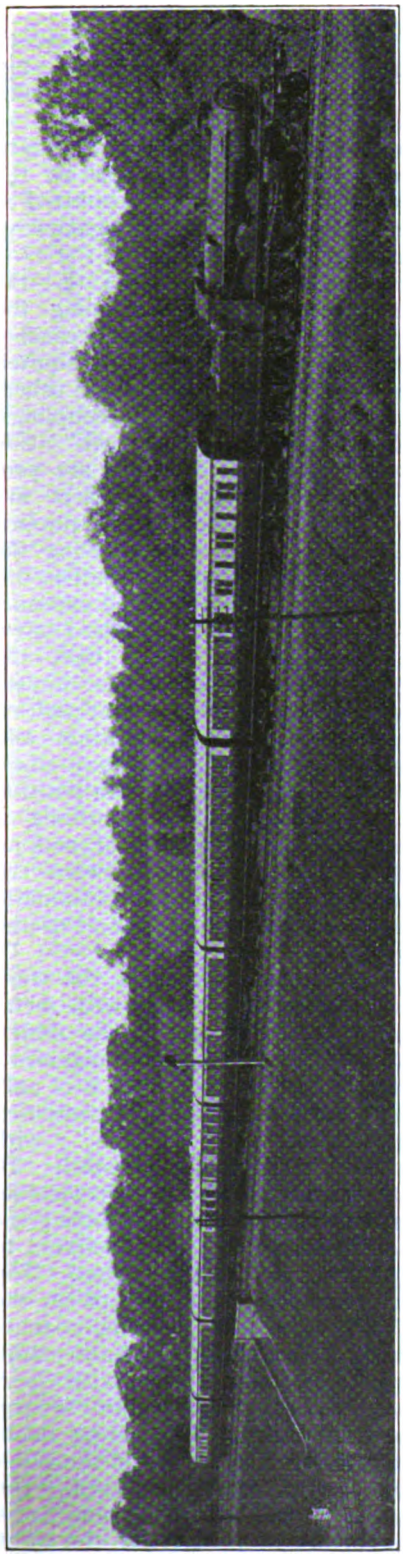

GENERAL VIEW OF NEW TRAIN FOR SOUTH WALES SERVICES

New Main Line Rolling Stock,

GREAT WESTERN RAILWAY.

CONTINUING the policy of providing only the best rolling-stock for principal services, the Great Western Railway has recently placed in traffic two new trains consisting of steel corridor compartment vehicles with restaurant car, and including many new features of construction and equipment. These trains are now running on the South Wales services, but others will be used for the Birkenhead and Cornish Riviera services.

An inspection of the vehicles makes it abundantly clear that every effort has been made to provide in the greatest measure possible for the comfort and convenience of passengers, and it would, we think, be difficult to plan, within the available loading gauge dimensions, a more roomy and well-appointed set of coaches of the corridor-compartment type. Extreme care has been taken to provide liberal seating accommodation, together with the most adequate lighting and ventilating arrangements, while a general aspect of cleanliness and comfort may be said to pervade the whole of the train. The new vehicles are, moreover, of special interest from the point of view of what may be termed "mechanical" design and equipment and there are several details in which they differ from previous Great Western Railway rolling-stock and that usually found on other British railways. Each train consists of seven vehicles ranging from 70 ft. to 71 ft. 4½ in. in length over the body, a uniform width of 9 ft. being employed. These vehicles are as follows: brake-third, third, first and third composite, restaurant car, first and third composite, third and brake-third.

Underframes are constructed of rolled steel sections, the solebars and longitudinals being channels, and the truss rods, pillars and trimmers of angles, whilst plates and angles are used for building up the frame bolsters and headstocks. Each solebar and longitudinal is trussed between the bogies to give requisite strength, and special members are provided in the underframe for carrying the dynamo and battery

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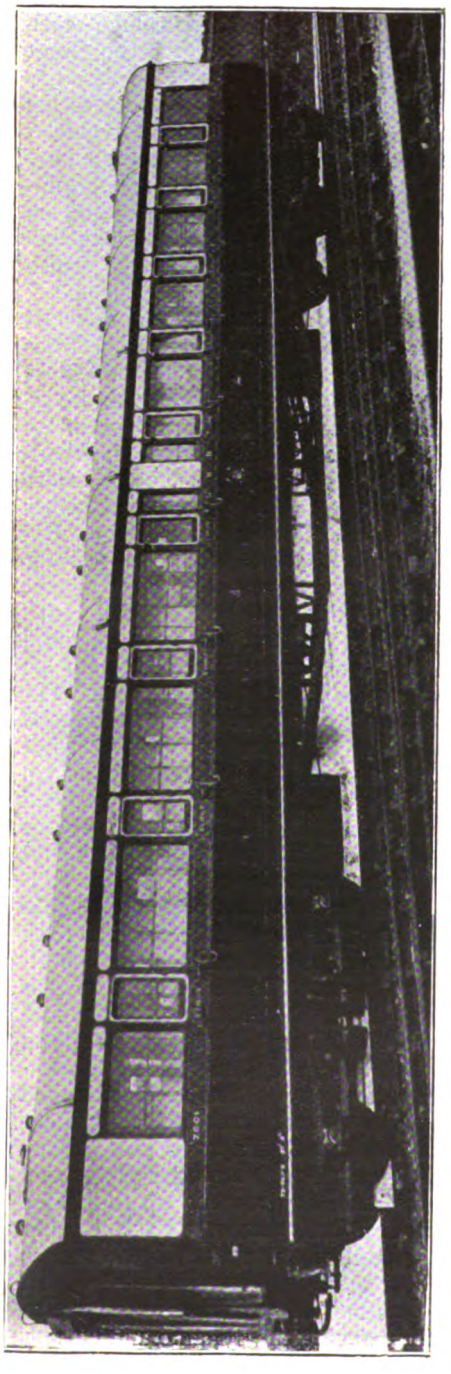
boxes of the electric lighting equipment, which is on the Leitner system.

A point of special interest is that the coaches, with the exception of the two brake thirds and two third-class coaches, are fitted at each end with Laycock "Buckeye" automatic couplers and gangways. The two thirds are fitted with "Buckeye" couplers and gangways at one end and Great Western standard gangways and screw couplings at the other, while the brake thirds are fitted at both ends with Great Western gangways and couplings.



FIRST AND THIRD-CLASS COMPOSITE COACH.

Another interesting feature is the arrangement made for overcoming the difficulty which arises when railway coaches fitted with automatic couplers are required at times to couple up and run with others having side buffers and screw couplings. Specially designed "drop-down" side buffers and gangway adapters are provided where "Buckeye" couplers are used to permit the vehicles thus equipped being coupled up to others having the standard fittings. When side buffers are used the coupler head is dropped exposing a draw-hook to which the standard screw coupling is attached, whilst with the automatic couplings in use the buffers are lowered and held firmly in that position by means of a Y-shaped bracket and suitable fastenings. The gangway adapters are, when necessary, fixed in position between the "bellows" or vestibule of each coach for the purpose of making up the increased distance between the coaches, when one of the automatic coupler type is connected to one of the standard pattern.

The bogies used throughout the train are of the four-wheeled type with metal frames, the special feature of the design being the bolster suspension arrangement. The body framing of each coach is of oak, the floors being fireproof and composed of corrugated iron and "Decolite"; with outside roofs and panels of steel. To facilitate cleaning, the use of projecting waist or window mouldings is avoided, the pillars and window rails being rebated to take quarter and corridor lights. Top lights are dispensed with, except on the dining car. The ends of the coaches fitted with "Buckeye" automatic couplers are bow-shaped, but those with Great Western Railway gangways are square, with no turn-under. The sliding doors giving access to and shutting off the gangways are thus of necessity curved. The coaches are all painted in the new Great Western colours: namely, with the waist and bottom panels chocolate, and top

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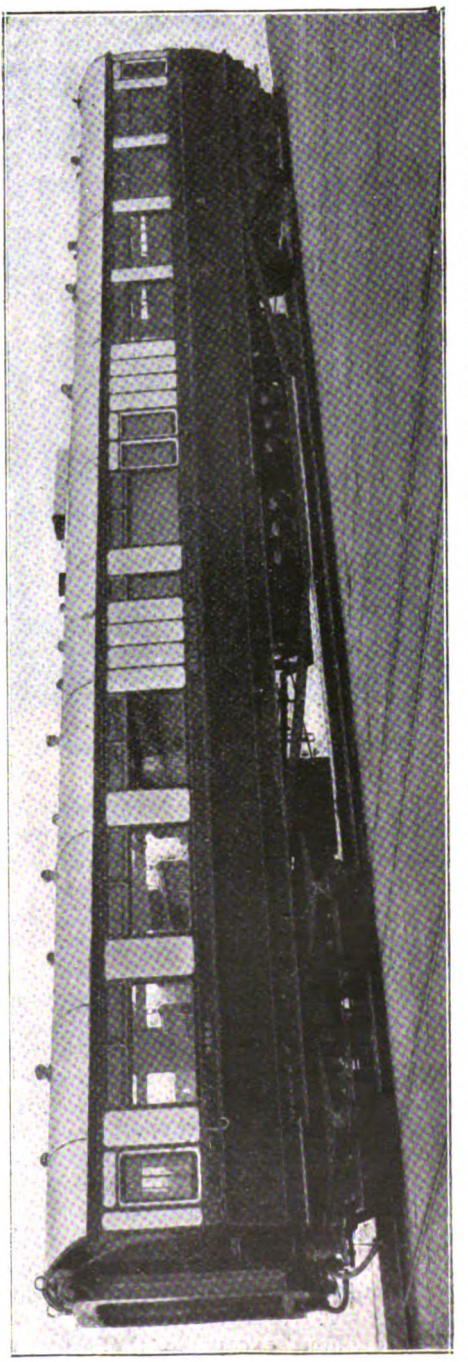
panels above the waist cream colour. The bodies are lined out in black, edged with yellow, the moulding being dispensed with. The roofs are finished in white.

Each composite coach has four first and five third-class compartments, seating 24 first and 40 third-class passengers, a door in the corridor dividing first and third. A lavatory for each class is provided at the ends of the coach. The third-class coaches have 10 compartments, with seating accommodation for 80 passengers. In the brake thirds ample provision is made for passenger's luggage and the guard, in addition to four third-class compartments (seating 32 passengers), and a lavatory at one end only. A door in the corridor shuts off the passenger portion from the guard and luggage.

Each first-class compartment is upholstered in brown cloth with brown and gold lace. The floor is covered with linoleum, and a brown rug, with border and G.W.R. monogram in black, extends from door to door. Antimacassars are provided for the tops of seat backs, and a double looped arm sling is secured to each door pillar. The window and door blinds, which are brown and gold, are arranged to roll up into the body framing, thus being protected from sun and dust. The interior woodwork, such as doors, mirror frames, &c., is polished walnut and the panels are of polished sycamore, a very pleasing effect resulting from this combination. The brackets for supporting the light luggage rack on each side of the compartment have small hooks on the underside for holding umbrellas or walking sticks. Ash trays, door catches, locks, and steam-heating fittings are of lacquered brass.

The upholstering in each third-class compartment is black and red rep, red being predominant, and the floor is covered with linoleum. The seat backs are stitched through in four rows, which dispenses with buttons and facilitates cleaning. A smaller arm rest than that previously used is fixed below each window; this gives an increased seating space. The blinds are of black and red material and roll up into the body framing. The interiors of the compartments are finished in mahogany with birchwood panels above the luggage racks. The light luggage rack supporting brackets are of the same pattern as those in the first-class compartments. The metal furniture is of lacquered brass.

In all compartments the ceilings are of birchwood veneer, enamelled white to assist the lighting. Five electric lights



RESTAURANT CAR WITH KITCHEN AND PANTRY BETWEEN FIRST AND THIRD-CLASS SECTIONS.

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INTERIOR OF FIRST-CLASS COMPARTMENT.

are fitted in each first-class compartment, these being suspended from the ceiling, one in the centre and one over each corner seat, switch control being conveniently fitted. A switch is also provided for dimming the centre light in each compartment. In each third-class compartment three electric lights are arranged in a straight line between the doors. Over each seat is a number to enable passengers readily to discern their seats when booked in accordance with the Great Western Railway registration of seats system.

The train is fitted with through steam-heating pipes, with "atmospheric" heaters independently controlled by a lever in each compartment. The air extractors on the roof are arranged in all compartments on the same principle as on the dining car. Side corridors are provided throughout except in the saloons of the dining car, which have the usual gangway down the centre with a vestibule at each end. Gangway doors are provided at each end of all the coaches, those vehicles with bow ends having, as previously mentioned, radial doors.

To obtain steady riding, the dining car has been designed with the kitchen and pantry in the centre, with the first-class saloon at one end, and the third-class at the other end of the vehicle. This car will accommodate 18 first and 32 third-class diners. The seats in both saloon compartments are of the "tip-up" type, upholstered in brown leather. Above the seat backs are brass net racks for light articles only. The tables are mahogany in the third-class and walnut in the first, and are covered with leather. On the floors special carpet is laid upon linoleum. The interior finishing in the first-class is in rich dark polished walnut, with sycamore panels, and the third-class polished mahogany. The ceilings are of three-ply birchwood veneer, white enamelled. Projecting dust-catching ledges are non-existent. Electric fans and bells are provided, and the car is well lighted throughout by electricity. Special attention has been given to ventilation; in addition to the top portion of each side light being hinged to open, the air extractors on the roof have been modified. Instead of passing direct through the outside roof and ceiling into the compartment, they now pass through the outside roof into the space between the roof and ceiling, extracting the air from positions immediately above the dining tables, the projecting lips for manipulating the extractors being within easy reach of the passengers. This arrangement will prevent ashes or dust passing into the saloons.

The kitchen is equipped with an improved Fletcher's gas stove, 100-gallon cold water tank, hot water tank, teak wash-up draining boards, vegetable box,

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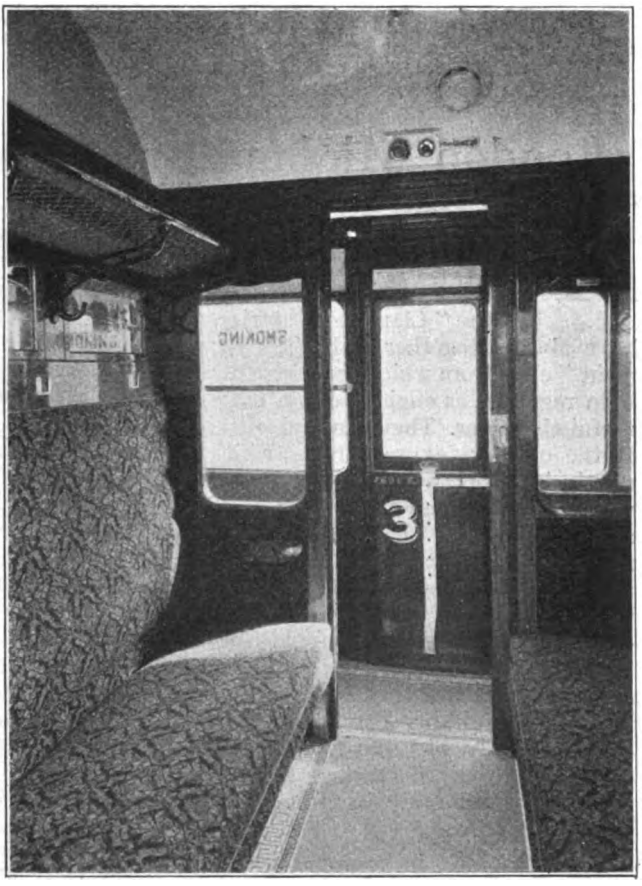
table, cellar and various cupboards. To prevent fumes passing from the kitchen to the saloons, a special (and very successful) large air extractor has been fitted to the roof. The pantry is fitted with teak wash-up draining board, hot water supply, wine bin, tables, cellar and numerous cupboards. In the corridor outside the kitchen and pantry, butter cupboards and refrigerators are provded, while between the kitchen and one of the saloons is another refrigerator. Wood mats cover the floor in the kitchen, and coir mats are placed along the corridor outside the pantry and kitchen to prevent grease and dirt being carried into the saloons.

Great Western standard vacuum brake equipment is fitted throughout the train, and a hand brake is provided in each guard's compartment. Passenger emergency chain communication is fitted in all coaches. All the usual safety appliances such as fire extinguishers, first-aid cabinets, emergency tool boxes, &c., are installed on the train.



INTERIOR OF THIRD-CLASS COMPARTMENT.

The general appearance of the train is particularly pleasing, the standard of uniformity being complete, whilst the liberal proportions and fresh style of finish greatly add to the attractiveness of the vehicles.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE NINETEENTH CENTURY.

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Under this heading Mr. E. L. Ahrons will deal with the Locomotives and Trains of the

MIDLAND AND GREAT NORTHERN JOINT RAILWAY.

in the forthcoming RAILWAY MAGAZINE, August, 1923.

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Rebuilt "Prince of Wales" Class Locomotive, London Midland and Scottish Railway.

ALTHOUGH these well-known London and North Western locomotives necessarily take second place to the "Claughton" series, they have always, together with the "Experiment" class from which they were derived, been regarded as engines of an extremely useful character. They can deal with many of the ordinary express trains, while their relatively short wheelbase and moderate weight enable them to be used on almost any section of the line. They have sufficient power capacity for heavy hauling duties at moderate speed, and with reasonable loads they have a very good character for speediness, notwithstanding the moderate diameter of their coupled wheels. For heavy express goods trains they are admirably fitted, and they can deal efficiently with most of the ordinary goods and mixed traffic turns which figure so prominently in the general work of a great railway.

These engines, in common with nearly all modern London and North Western locomotives, apart from the "Claughton" class, are fitted with the Joy valve gear. This gear, although it has given splendid service for many years past, and has been virtually standard on both the late London and North Western and Lancashire and Yorkshire Railways, has one drawback, that the pivot for the "jack-link" necessitates a hole being drilled in the connecting rod, and although this fact is taken fully into account in the design of the rod, the fact that a fracture of such a rod recently occurred has caused the responsible engineers to consider a means whereby the Walschaert valve gear could be applied to the class. This is, of course, practicable by using a single eccentric; but instead of adopting that method, Mr. H. P. M. Beames, Mechanical Engineer, Crewe, in consultation with Mr. G. Hughes, Chief Mechanical and Electrical Engineer, has designed an adaptation of the Walschaert gear to enable it to be operated from the outside coupling rod and a return crank, although cylinders and valves are between the frames.

The photograph reproduced shows the lay-out of the valve motion outside the frames. The combining lever is driven from the forward end of the coupling rod, instead of from the piston crosshead, as usual. The motion is transferred to the valve spindle inside the frames by means of a rocking shaft. This is a simple and convenient arrangement. The running board of the engine has been raised to allow a clearance for the working of the gear, and this incidentally assists in making the side rod lubricators accessible on the top centre.

Summarised, the chief objects aimed at in the design are:—

1. The accessibility of all motion parts for examination, and removal in cases of running repairs.
2. The ease whereby the driver and fireman may oil and inspect each part.
3. The elimination of the objectionable hole in the connecting rod from which the valve drive is taken in the case of engines with "Joy" motion, thus causing less likelihood of bent rods when valve friction becomes excessive.
4. Decreased maintenance cost, so far as the motion generally is concerned.
5. The advantages of an outside cylinder engine as far as accessibility is concerned and an inside cylinder engine from a steady running point of view.

The locomotive illustrated, No. 964, "Bret Harte," is the first of the class to be thus equipped, and on Sunday, April 22, this engine made a return trip under test conditions between Crewe and Carlisle, with a train comprised of 13 passenger vehicles, weighing 364 tons, and a dynamometer car weighing 36 tons, a load behind the tender of 400 tons. The engine and tender in working order weigh 107 tons, so that the gross weight of the locomotive and its train amounted to 507 tons. The total distance is 141·1 miles and the time occupied on the outward journey was 3 hours 27½ min., including an out-of-course stop made at Oxenholme, owing to there being no water in the troughs after passing Lancaster. The

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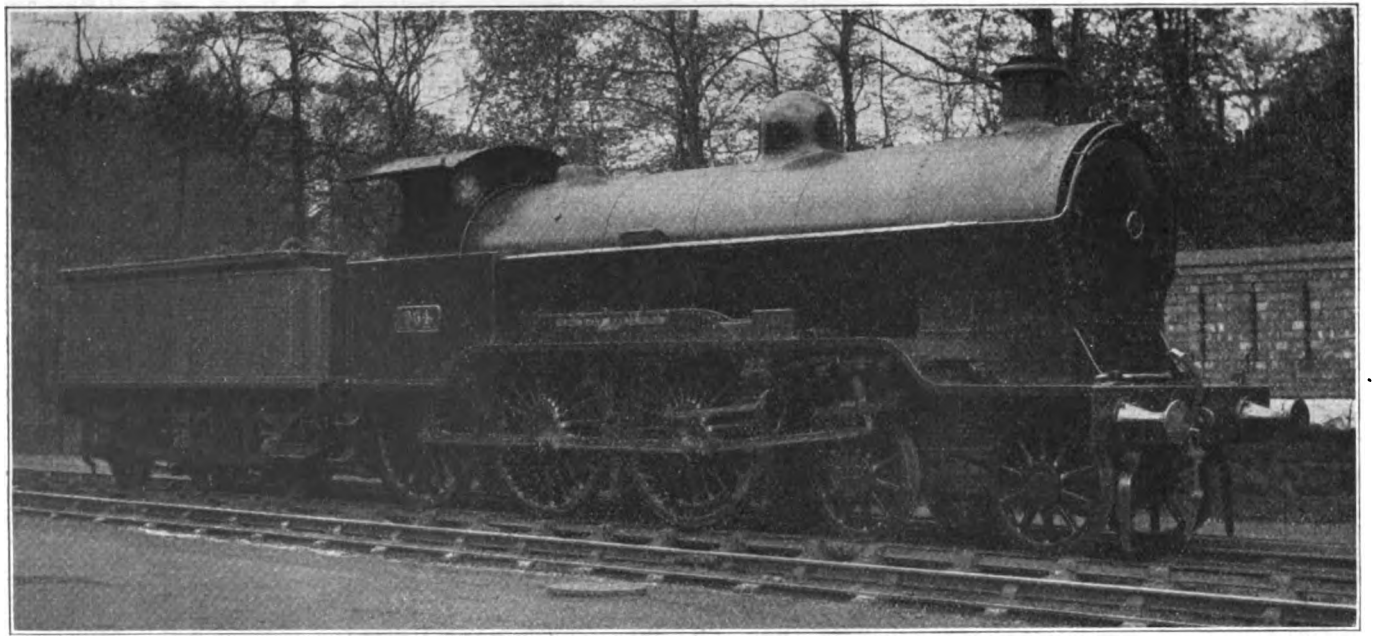

4-6-0 INSIDE-CYLINDER LOCOMOTIVE, No. 964, "BRET HARTE," LONDON MIDLAND & SCOTTISH RAILWAY, FITTED WITH OUTSIDE WALSCHAERT VALVE GEAR.

Cylinders, diam.	20½ in.
Cylinders, piston stroke ..	26 in.
Wheels (bogie), diam. ..	3 ft. 9 in.
Wheels (coupled), diam. ..	6 ft. 3 in.
Wheelbase, rigid	13 ft. 7 in.
Wheelbase, engine	26 ft. 8½ in.
Boiler pressure	175 lb. per sq. in.

Heating surface—	
152 tubes, 1⅞ in. external dia.	969·9 sq. ft.
24 tubes, 5 in. external dia.	405·9 sq. ft.
Firebox	135·8 sq. ft.
Total heating surface of boiler	1,511·6 sq. ft.
24 sets of superheater tubes	304·4 sq. ft.
Total heating surface ..	1,816·0 sq. ft.
Grate area	25 sq. ft.

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engine had to be nursed somewhat during the ascent of Shap on account of tender water shortage before reaching Carlisle. On arrival at the latter station, the water level was only just showing in the bottom of the tender water-gauge glass.

The return journey started at 2.4 p.m., Crewe being reached at 5.29⅜ p.m., *i.e.*, in 3 hours 25⅜ min. The maximum speed reached on the outward journey was slightly above 70 m.p.h., and on the return journey, 80 m.p.h. The maximum pull at starting was 16½ tons and a minimum of 8⅜ tons, the stopping pull ranging from 11 tons to 4½ tons. Slackening of speed occurred by signal at various points, also stops for picking up and dropping pilots on a section over which single line working was in operation. Steam pressure was maintained with great uniformity during the bulk of the trip, ranging for the most part from 170 to 180 lb.

LONDON & NORTH EASTERN RAILWAY LOCOMOTIVES.

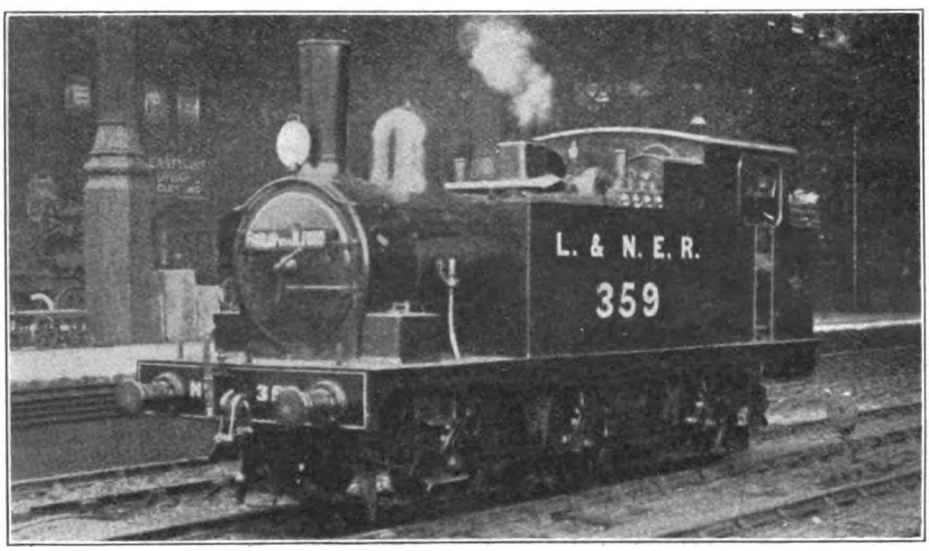

Photo.] [*J. F. Gairns.*

THROUGHOUT the London and North Eastern Railway engines of various classes and belonging to all sections, are now appearing in the new liveries. Our frontispiece illustrates one of the Great Eastern 4–6–0 engines painted green, as used for express passenger locomotives, a great change from the blue livery so long characteristic of this line. No. 1534 also has the new lettering and numbering adopted as the standard for all sections of the London and North-Eastern Railway.

Although some of the tank engines have been painted green, most of them are appearing in a neat black, with artistic lining and gold letters and numerals, as in the case of tender goods engines. The view reproduced shows a Great Eastern 0–6–0 tank engine, used as the East Side shunter at Liverpool Street station, though when photographed it was standing in the main line station.

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Summer Train Services. [No. I].

ALTHOUGH we have to go to press too early to expect that particulars of all the train service and traffic developments to be credited to the summer of 1923 would be available in time for reference this month, the arrangements as so far announced indicate that pre-war facilities not yet restored will again appear, in some cases in improved forms, that there will be many interesting and notable accelerations, and that improved connections are to be the rule, while the record of 1923 will include numerous new facilities and new through carriage or through train services.

A few of the new services indicate the trend of development to be expected as a result of grouping. In many cases, however, the changes are such as might be expected as the result of ordinary development. But, in numerous instances, as will be seen, the improved facilities are of a distinctly notable character. They include a new "fastest run" at 61·6 m.p.h. on the Great Western; a new long, non-stop run, between London and York, 188 miles; new through carriage services from London to Elgin and Lossiemouth; and many incidental improvements. An important feature calling for special emphasis is the large number of new connections, resulting frequently in substantial reductions in journey times, though it does not follow that high-speed schedules are necessarily involved.

Further particulars will be given next month, when we hope to deal fully with the London Midland and Scottish and Southern Railway arrangements. Meanwhile, the Great Western and London and North Eastern particulars, together with those of certain other lines, provide a record of progress and development which must be regarded as a favourable augury for the future.

GREAT WESTERN RAILWAY.

This company's summer time-table will be brought into operation on Monday, July 9, and will include additional and altered services of an extensive character, many sections having been entirely remodelled with the object of improving through express travel on the main and cross-country routes. Attention has also been given to services on residential, local and branch lines.

West of England Services.

The principal features affect the following trains from Paddington:—9.15 a.m. for Kingswear, calling at Ealing (Broadway), Reading, Frome, Taunton, Exeter, Dawlish, Teignmouth, Newton Abbot and Torquay line stations, with connecting services and through carriages to Minehead and Ilfracombe; 9.30 a.m. for Weymouth Town and Quay, in connection with a daily steamer to the Channel Islands; 11.10 a.m. for Penzance calling at Exeter, Plymouth (North Road), and principal stations beyond, arriving at Penzance at 6.30 p.m. There will be through carriages to Kingsbridge (Saturdays excepted). On Saturdays a train will leave Paddington at 11.0 a.m. for Kingsbridge, Plymouth and Newquay, arriving at Kingsbridge at 3.46, Plymouth (North Road) 3.22, and Newquay 5.30 p.m. 12.0 noon, non-stop to Torquay, arriving 3.35 p.m. 12.5 p.m., for Minehead, Ilfracombe and Exeter, with coach connections from Minehead to Lynton and Lynmouth and Dulverton to Lynton and Lynmouth via Simonsbath. 3.30 p.m., for Plymouth, calling at Exeter, Dawlish, Teignmouth, Newton Abbot, and arriving at Plymouth (North Road) at 8.7 and Millbay 8.15 p.m. Carriages will be slipped at Westbury at 5.7 p.m. for Weymouth, and at Taunton for Minehead and Ilfracombe. There will be a connecting service to the Torquay line with through carriages.

The 9.10 a.m. from Liverpool (Lime Street) and 9.25 a.m. from Manchester (London Road) to Plymouth will be extended to Newquay and Falmouth. The 11.30 a.m. from Kingswear (12.10 p.m. from Torquay) to Paddington will run non-stop to Paddington, arriving at 3.45 p.m. A train will leave Truro at 9.50 a.m., Plymouth (North Road) 11.50, Exeter 1.25 p.m., and arrive at Reading at 3.50 and Paddington at 4.35 p.m.

Other services which may be mentioned are:—Ilfracombe at 11.45 a.m. (with coach connection from Lynton via Simonsbath), arriving at Paddington at 5.30 p.m., with connections from Minehead and Weymouth. The 1.0 p.m. from Plymouth to Liverpool and Manchester will start from Penzance at 10.10 a.m. and call at principal intermediate stations to Par. On Saturdays a train will leave Newquay at 12.15 p.m. for Paddington, calling at Par, Lostwithiel, Liskeard, Plymouth (North Road) and

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Newton Abbot, arriving at Paddington at 7.5 p.m. A connecting service with through carriages will leave Paignton at 2.45 and Torquay at 2.55 p.m.

The sailings from the Channel Islands will be daily, Jersey depart 7.30 a.m., Guernsey 10.0 a.m., and an accelerated service will be given, arriving Westbury at 5.32, Reading at 6.58, and Paddington at 7.35 p.m. The 4.10 p.m. from Plymouth to Paddington will run via Westbury, slipping a carriage at Newbury for Reading and arriving at Paddington at 9.0 p.m., shortening the journey to Paddington by 85 minutes. A connecting service will be given from the Torquay line, Ilfracombe at 2.45 p.m., and Minehead at 4.25 p.m. The 10.30 a.m. "Cornish Riviera" express from Paddington to Penzance will run on Sundays. An express train will leave Penzance on Sundays at 12.15 p.m. for Paddington, calling at Marazion, St. Erth, Hayle, Camborne, Redruth, Truro, St. Austell and Par, and leaving Plymouth (North Road) at 3.10 p.m., Exeter 4.26, Westbury 6.5, and arriving at Paddington at 7.55 p.m.

LONDON, GLOUCESTER, CHELTENHAM AND SOUTH WALES.

A fast train will be run from Carmarthen to Aberystwyth in connection with the 8.45 a.m. train from Paddington to Fishguard Harbour, giving an arrival at Aberystwyth at 3.57 p.m. There will be a through carriage from Paddington to Aberystwyth. The return train will leave Aberystwyth at 10.5 a.m. for Carmarthen in connection with the 10.50 a.m. train from Neyland, due at Paddington 6.15 p.m. A through carriage will be run from Aberystwyth to Paddington.

The 2.30 p.m. from Cheltenham (2.40 p.m. from Gloucester) to Paddington will be accelerated from Swindon to arrive at Paddington at 5.0 p.m.—10 minutes earlier. This train will perform the journey from Swindon to Paddington—a distance of 77¼ miles—in 75 minutes, now the fastest start-to-stop run in the British Isles.

NORTHERN SERVICES.

The 12.15 a.m. from Paddington to Birkenhead will convey a sleeping car. The 7.15 a.m. from Leamington will be accelerated to arrive at Shrewsbury at 9.33, Wrexham 10.21, Chester 10.39, and Birkenhead (Woodside) at 11.15 a.m. A train will leave Birmingham (Snow Hill) at 9.10 a.m. and Wolverhampton (Low Level) at 9.35 a.m. for Aberystwyth, due at 1.40 p.m. A train will leave Birmingham (Snow Hill) at 10.0 a.m. and Wolverhampton (Low Level) at 10.23 a.m. for Birkenhead, calling at Shrewsbury, Gobowen and Wrexham, and arriving at Chester at 12.10 p.m., and Birkenhead (Woodside) at 12.58 p.m. There will be a connecting service from Chester to Holyhead enabling passengers to catch the afternoon steamer from Holyhead to Dublin

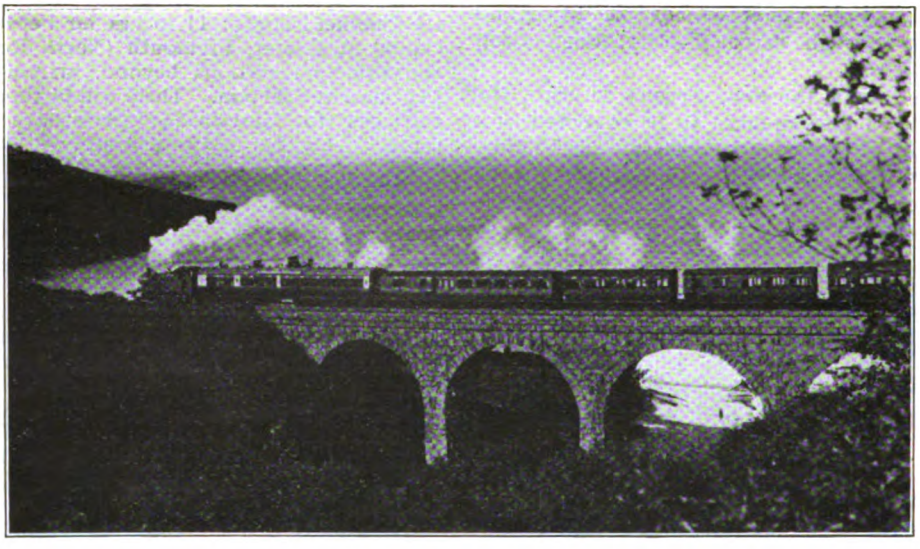

Photo.] GREAT WESTERN RAILWAY. [*E. A. Gurney Smith.*

St. Ives Branch Train leaving Carbis Bay. First vehicle is through coach off the "Cornish Riviera" express.

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Other trains calling for consideration are: Birmingham (Snow Hill) at 11.0 a.m., for Aberystwyth, due 3.25 p.m. Paddington 10.20 a.m., for Birkenhead, running non-stop Paddington to Birmingham and Birmingham to Chester, calling afterwards at Hooton and Rock Ferry only, and for the Cambrian Coast via Welshpool, run separately from Birmingham, calling at Wolverhampton at 12.50 p.m., and arriving at Aberystwyth 4.15 p.m. A connecting service will be given to Llanidloes, Builth Wells and Brecon. The 2.20 p.m. from Paddington to Birkenhead will start at 2.10 p.m. and be accelerated to arrive at Chester at 6.19 p.m., 31 minutes earlier and Birkenhead (Woodside) at 6.55 p.m., 35 minutes earlier. The 4.0 p.m. from Paddington to Birkenhead will start at 4.10 p.m. and be accelerated to arrive at Chester at 8.20 and Birkenhead (Woodside) 9.0 p.m.

A train will leave Aberystwyth at 11.0 a.m. for Birmingham (Snow Hill). The 12.15 p.m. from Birkenhead (Woodside) will start at 1.2 p.m., leave Chester at 1.38 p.m., and be accelerated to arrive at Birmingham (Snow Hill) and Paddington as at present. A train will leave Birkenhead (Woodside) at 2.5 p.m. for Paddington, calling at Rock Ferry, Chester and Birmingham (Snow Hill) only. The train will leave Chester at 2.40, Birmingham at 4.40 and arrive at Paddington at 6.40 p.m. A connecting service from the Cambrian Coast with through carriages will be afforded at Birmingham, leaving Aberystwyth at 12 noon. A train will leave Birkenhead (Woodside) at 7.15 p.m. for Birmingham calling at Chester, Wrexham, Ruabon, Gobowen, Shrewsbury, Wellington and Wolverhampton. A sleeping car train will leave Shrewsbury at 9.50 p.m., Wolverhampton (Low Level) 11.5 p.m., and Birmingham (Snow Hill) at 11.55 p.m. for Paddington, via Oxford, arriving at Paddington at 3.30 a.m. The 11.10 a.m. from Paddington to Birkenhead on Sundays will start at 12.50 p.m., and run to Birmingham in two hours, calling at Leamington at 2.21 and arriving at Birmingham (Snow Hill) at 2.50, Wolverhampton (Low Level) 3.20, Shrewsbury 4.7, Chester 5.23, and Birkenhead (Woodside) 6.23 p.m.

Cross-Country Services.

Birmingham (Snow Hill) at 10.0 a.m.; Stratford-on-Avon 10.35 and Cheltenham (Malvern Road) at 11.14 a.m. for the Torquay Line, Plymouth, Newquay and Falmouth. Paignton at 11.35 a.m., for Cheltenham (Malvern Road), Stratford-on-Avon, Birmingham (Snow Hill) and Wolverhampton (Low Level), with connecting train and through carriages from Plymouth.

A train will leave Cardiff at 11.35 a.m. in connection with the 8.0 a.m. from Fishguard Harbour, and Newport at 11.58 a.m., for the Torquay line and Plymouth. On Saturdays, July 14 to September 8, the train will be extended to Falmouth, calling at the principal intermediate stations, with a connection to Newquay. A new through service will be introduced, leaving Neyland at 8.0 a.m., Swansea (High Street) 10.45, Cardiff 12.50, and Newport at 1.18 p.m. for the Torquay line, serving Weston-super-Mare, Taunton, Exeter, Dawlish, Teignmouth, Newton Abbot and Paignton. A through train from Paignton to Cardiff will leave Paignton at 12.40 p.m.

Manchester, Liverpool and the Cambrian Coast.

Improved communication between Manchester, Liverpool, and the Cambrian Coast will be afforded by the introduction of new fast services from Birkenhead (Woodside) at 9.5 a.m.; Manchester (Exchange) at 11.20 a.m., with a connection from Birkenhead at 12.10 p.m.; Birkenhead at 12.50 p.m.; Aberystwyth to Birkenhead at 10.15 a.m., and Pwllheli at 10.25 a.m. for Manchester; with a connecting service from Chester to Birkenhead. The 5.13 p.m. from Birkenhead to Barmouth will be extended to Pwllheli, arriving at 10.10 p.m.

Miscellaneous Items.

On Mondays and Saturdays through services will be afforded between the principal places in South Wales and Llandrindod Wells and the Cambrian coast. Considerable augmentation of Sunday services on various parts of the system is included in the timetable, and a number of additional stations will be opened.

The price of the company's large timetable will be reduced from 6d. to 3d. and the pocket time-tables from 3d. to 1d.

LONDON & NORTH EASTERN RAILWAY.

A glance at a map of England and Scotland is sufficient to indicate how markedly the combination of railways now forming the London & North Eastern Railway has brought within one ownership and chief direction systems of lines and routes serving every East Coast holiday resort, and not a few inland places of historic and tourist renown, besides rendering it possible for this company to connect a large number of the principal cities and towns with others and with ports and busy industrial areas, without reference to any other company. In fact, it may be said that from Southend to Lossiemouth every one of the almost innumerable places of holiday interest along the East Coast is served directly if not exclusively by the London & North Eastern Railway,

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involving variety as great as the extent of coast mileage, while inland it serves the spas of Harrogate and Ripon, also providing the well-known cathedral route to the North, besides giving access and in many cases supplying the principal services between London and Leicester, Nottingham, Sheffield Leeds, Bradford, Doncaster, York, Darlington, Stockton, Middlesbrough, Hull, Grimsby, Newcastle, Edinburgh, Glasgow, Perth, Dundee, Aberdeen, &c. The London and North Eastern Railway also provides a through route from London and nearly every other part of Great Britain to St. Andrews, the headquarters of "The Royal and Ancient Game of Golf."

In addition, though the London & North Eastern Railway is primarily an eastern system, it provides access, either on its own lines, or in association with other companies, to a large number of other services, so that in addition to places and areas peculiarly its own, it affords facilities on an even more extended scale. Therefore, in providing the "feast of good things" anticipated for the 1923 Summer Train Services, the London & North Eastern Railway will be responsible, as from July 9, for notable train accelerations and new and extended facilities within its own boundaries, and also for important developments in conjunction with the London Midland & Scottish, Great Western and Southern Railways

To some extent the particulars that follow can only be indicated in outline, pending the completion of time-table preparation and the announcement of train schedules in detail. There is, however, a great deal of material of special interest in the way of accelerations of standard express trains connecting principal towns and cities, these being of value both to the business man and to the holiday maker; improved express trains between large towns and favourite holiday resorts, both coast and inland; new services beyond the old frontier points, most of which are now either non-existent or which cease to constitute rigid limits of ownership, so that extension beyond them no longer involves running powers or traffic agreements, or are now only frontiers where the interests of other companies are concerned; together with numerous through-working arrangements in association with others of the four great systems of the new railway era. There are also many improvements and developments of more local interest, while nearly if not quite all the standard summer arrangements of the past, including those of pre-war years not already restored, are retained and in some cases augmented, though in most instances these must be "taken as read" in the following notes, which are necessarily concerned mainly with the actual novelties which are to be credited to 1923.

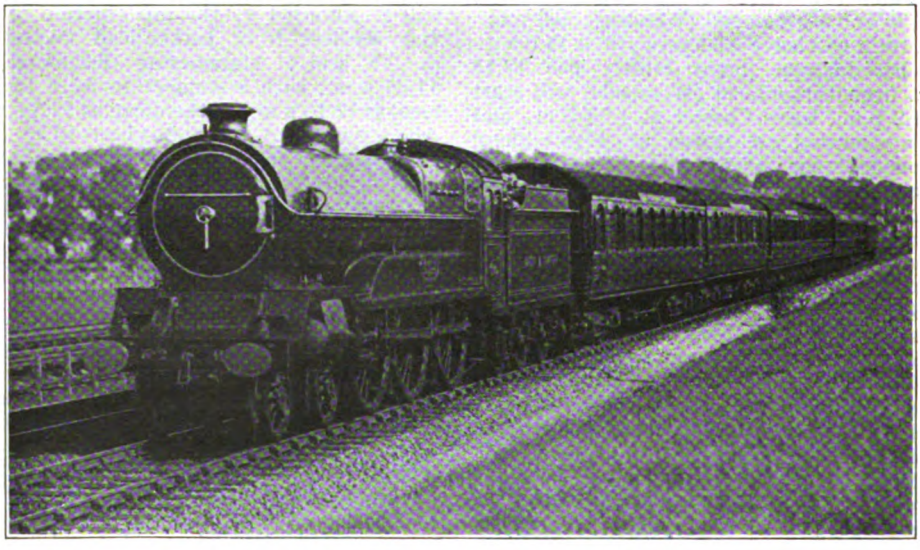

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*F. E. Mackay.*

Marylebone–Manchester Restaurant Car Express. Great Central four-cylinder 4-6-0 locomotive, No. 1165, "Valour."

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THE EAST COAST ROUTE.

Dealing first with the Anglo-Scottish main line, the principal feature of the train service improvements and developments is, firstly, acceleration in train running for overall journeys; secondly, incidental speeding-up to enable connections to be made whereby times occupied in other than the direct main line journeys are very considerably reduced; and, thirdly, new facilities and developments of those provided in the past. As regards direct accelerations, the 9.50 a.m. from King's Cross gains 15 min. to Edinburgh, while the 10.0 a.m. "the Flying Scotsman," gives the same gain to both Edinburgh and Glasgow, and 21 min. to Perth and Aberdeen. The present 1.20 p.m. will leave 5 min. earlier and make a further gain of 5 min. to Edinburgh. The 11.20 a.m. pre-war Edinburgh express is to be restored, but will leave at 11.50 a.m. as a combined Scottish and Scarborough express, making a non-stop run of 188 miles to York, this being the first time this run has been made by publicly-booked trains. The new 11.50 will represent accelerations of 50 min. to Edinburgh and 51 min. to Glasgow. In the evening service the 7.30 p.m. for Perth, the Highland line and Aberdeen, instead of running in two portions at 7.30 and 7.38 p.m., is to be replaced by a Perth and Highland express at 7.45 p.m., taking also the Fort William sleeping cars and through carriages, and will give an acceleration of 63 min. to Perth, 80 min. to Inverness and 15 min. to Glasgow. The Aberdeen train will leave at 8.20 p.m., with a gain to Aberdeen of 50 min. This will convey a composite sleeping carriage working through over the Great North of Scotland section to Elgin and Lossiemouth, this being an entirely new facility (restaurant cars King's Cross to Grantham and Aberdeen to Lossiemouth). From July 27 to August 14, these trains will be relieved by a new 7.35 p.m. Highland through sleeping car express for Perth and beyond, travelling to Inverness via Grantown-on-Spey and Forres, instead of running direct from Aviemore to Inverness, so as to serve the attractive places mentioned. The late evening services from King's Cross will also share in the improvements, the present 10.20 and 10.30 p.m. sleeping car expresses being replaced by trains at 11.25 and 11.40 p.m., representing accelerations of 89 min. to Perth, 70 min. to Glasgow, 71 min. to Dundee, and 72 min. to Edinburgh, the Scottish capital being reached (for the first time since the war) in 8 hours.

In the opposite direction the 10.0 a.m. from Edinburgh will have an acceleration of 15 min. for passengers from Aberdeen, Glasgow and Edinburgh, while the 10.15 a.m. will give the same gain from Edinburgh and 20 min. from Perth. The 1.40 p.m. from Edinburgh will leave at 1.45 p.m. and provide accelerations of 10 min. from Aberdeen and Glasgow, 15 min. from Edinburgh, and

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*W. Rich.*

Leeds–Bristol Express near Cheltenham. Midland rebuilt 4–4–0 locomotive, No. 515.

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30 min. from Perth. The night trains will leave Edinburgh at 10.35 and 10.50 p.m., instead of 10.10 and 10.30 p.m., both reducing the journey time from Edinburgh to London by 45 min., Perth, depart 9.20 a.m. instead of 8.5 a.m., benefiting to the extent of 100 minutes in the case of the second train. The 7.15 p.m. from Aberdeen will leave at 7.35 p.m., giving an acceleration to London of 30 min. from Aberdeen and 25 min. from Glasgow. This train will provide the return service for the composite sleeping car from Lossiemouth and Elgin to King's Cross. From August 27 to October 14 the Highland service will be relieved by a special express from Inverness via Forres and Grantown-on-Spey, leaving Perth at 8.5 p.m., and being attached to the 10.35 p.m. from Edinburgh, due King's Cross, 6.50 a.m.

The Penzance-Aberdeen trains will be provided with sleeping cars throughout, thus avoiding the necessity for passengers changing at York or Swindon and rendering them available for use as desired and free from the complication due to the cars being also associated with other traffic. Another important development is the introduction of through carriages from Sheffield at 8.15 a.m., and York at 9.38 a.m., for Aberdeen, returning by the 12.50 p.m. from Aberdeen, and 5.15 p.m. from Edinburgh. Leeds will also have an additional through service, the 3.40 p.m. for York starting from Leeds at 2.40 p.m., incidentally giving an acceleration of 45 min. from Leeds.

The North Eastern Area.

While Newcastle has the benefit of developments in the Anglo-Scottish services, it has important improvements on its own account. The 5.30 p.m. from King's Cross will improve upon its already fast timing by 10 min., while the return 8.0 a.m. from Newcastle is to reach King's Cross at 1.30 p.m., a gain of 40 min. The latter train will not stop at York, the service therefrom to the south being given instead by continuing the 7.15 a.m. from Sunderland throughout to King's Cross, with a gain in time, as compared with last year's arrangements, of 17 min. Similarly, the 5.30 p.m. down train from King's Cross will omit York, being relieved by the 5.35 p.m. from London to Sunderland. In connection with these trains, the 10.27 a.m. from York to Sheffield and the Great Central section will leave at 9.50 a.m. via Selby, and will take through carriages off the 8.0 a.m. ex Newcastle.

Apart from connections with the Anglo-Scottish and Newcastle trains, a number of improved connections are made for the benefit of industrial towns in Yorkshire and Durham. Thus, the 7.8 a.m. from Sunderland to King's Cross will leave at 7.5 a.m. and reach King's Cross at 1.15 instead of 1.35 p.m., an improvement of 17 min. The 5.35 p.m. from King's Cross will serve York and run to Sunderland, acceleration 7 min. Additional trains from Middlesbrough to Darlington at 10.43 and 12.35 p.m. will give later departures from Middlesbrough and better connections, the accelerated journey times to London being 55 and 43 min. respectively. A new service from Darlington at 3.0 p.m. will enable Middlesbrough to be reached 68 min. earlier by the 10.0 a.m. from London. On Sundays services will be given from Middlesbrough at 2.15 p.m., due King's Cross 8.15 p.m., and from King's Cross at 8.30 a.m., due Middlesbrough at 5.13 p.m.

Scarborough and Whitby and other Yorkshire Coast resorts have the benefit of several accelerated and additional services. The 11.50 a.m. Scotch express will run from King's Cross to York without stop, and will include through carriages for Scarborough, due 4.20 p.m., an acceleration of 47 min., the journey of 230 miles being performed in 4½ hours at an average speed of over 51 miles per hour. The up train, leaving Scarborough at 3.0 p.m., will also run non-stop from York to London, due 7.30 p.m., 40 min. better than last year. There will also be additional trains between York and Scarborough, including one from York at 9.35 p.m. (Saturdays excepted), giving a later service from London, Leeds, &c. The Birmingham portion of the 2.45 p.m. from Scarborough will be run separately to York, giving an improvement of 25 min. The 11.55 a.m. from Leeds to Scarborough, together with the return train from Scarborough at 2.20 p.m. will be extended to run through and to Liverpool (Lime Street).

To improve the Bridlington service the 8.55 a.m. from Hull to Liverpool will start from Bridlington at 8.0 a.m., the 1.50 p.m. from Liverpool providing the return service. Through carriages for Sheffield will be provided on the 8.45 a.m. from Bridlington and the 2 p.m. from Sheffield. Numerous other improvements are also to be made in services to and from the Yorkshire and Durham towns and coast resorts, including greatly improved connections with main line trains. An important development which must be mentioned is that the through carriages for Middlesbrough on the 5.35 p.m. from King's Cross will be extended to Redcar and Saltburn.

London, Leeds, and Harrogate Services.

Dealing now with the London, Leeds and Harrogate service, special interest attaches

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to the first and third class Pullman car express to be inaugurated, covering the journey between King's Cross and Leeds each way, without stopping in 3 hr. 25 min., and serving also Harrogate, Ripon and continuing to Newcastle, so that the two Yorkshire spas will thus be provided with trains of Pullman stock, specially built for the service, both from the South and from the North. The Pullman supplement for the London - Harrogate journey, occupying 4 hours, it is understood, will be 7s. 6d. first-class and 4s. 0d. third-class. Trains will leave King's Cross and Harrogate, respectively, at 11.15 a.m.

In addition to this entirely new service, through carriages for Harrogate will be attached to the 7.5 and 10.10 a.m. and 1.40 and 5.40 p.m. expresses from King's Cross, the up Leeds express having corresponding services from Harrogate at 9.35 a.m., 12.30, 2.30 and 4.45 p.m. These services are associated with accelerations of the London-Leeds expresses as follows: From King's Cross, 10.10 a.m. (15 min.), 1.30 p.m. (18 min.), 4.0 p.m. (40 min.), 5.45 p.m. (10 min.); from Leeds, 7.50 a.m. (20 min.), 9.0 a.m. (new train), 10.15 a.m. (15 min.), 1.10 p.m. (10 min.), and 10.23 p.m. (additional service).

Acceleration of the 1.30 p.m. from King's Cross enables connection to be made with the 4.30 p.m. from Doncaster, giving an arrival in Hull at 5.23 p.m., a time gain to Hull of 29 min. The 9.5 a.m. from Hull will reach King's Cross at 1.15 p.m. instead of 1.35 p.m., while the down journey by the 5.35 p.m. from King's Cross will be reduced by 5 min.

Other Yorkshire towns will benefit by the accelerations of, and improvements in, the Leeds services. Thus, in connection with the new 9.0 a.m. from Leeds, there will be a through carriage service from Bradford at 8.40 a.m. to Wakefield (Westgate), while a through train from Halifax at 9.35 a.m. will connect at Wakefield with the up express due King's Cross 1.55 p.m. On Sundays a through carriage from the 5.0 p.m. ex King's Cross will be provided for Bradford, arriving at 9.50 p.m., a save of 31 min. The Marylebone-Bradford service will also be expedited, the 9.55 a.m. and 4.55 p.m. up expresses leaving 5 min. later in each case. Important additions will also be made in the inter-town services of the Yorkshire district, particularly affecting York, Sheffield, Hull, Darlington, Stockton, Middlesbrough, &c.

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Henry L. Salmon.*

Glasgow–Ayr Express passing Cardonald. Glasgow and South Western 4–6–4 tank engine, No. 543.

Lincolnshire Services.

Cleethorpes is to be given through services from King's Cross by the extension of the Grimsby portion of the 4.0 p.m. to Cleethorpes, the 9.20 a.m. from Grimsby to London starting from Cleethorpes at 8.45 a.m. Journey times are also accelerated each way, the throughout time occupying a little over four hours. The 7.0 p.m. from Sheffield to Cleethorpes and the 6.25 p.m. returning will

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be re-timed so as to connect in both directions with the 5.0 p.m. from King's Cross to York. The 8.27 p.m. train from Lincoln to Retford will connect with the 6.45 p.m. from Cleethorpes, giving an additional service from Great Eastern stations to Sheffield and Manchester. Improvements and accelerations will also be made on the Great Central route between Manchester, Sheffield, Grimsby and Cleethorpes, involving in some instances gains of 35 and 55 min.

One line was taken up during the war between Coningsby and Bellwater Junctions, on the Skegness route. This has now been restored and the pre-war services reinstated, thus increasing facilities between Manchester, Sheffield, Lincoln, &c., and Skegness. Augmented and accelerated services will also be given between Nottingham and Skegness, including the 5.45 p.m. from Nottingham (daily except Saturdays) and the 1.10 p.m. (Fridays) and 2.40 p.m. (Mondays) from Skegness.

Great Eastern Section.

The 12.25 p.m. Norfolk Coast express from Liverpool Street will be accelerated 6 min. to Cromer and 4 min. to Sheringham, while the following 12.30 p.m. Yarmouth non-stop restaurant car express will be accelerated 9 min. The up Norfolk Coast express will be accelerated 3 min. from Sheringham and 5 min. from Cromer, while the up 1.35 p.m. express from Yarmouth to Liverpool Street will represent an improvement of 10 min. Other additional and accelerated trains include the 1.52 p.m. from Felixstowe Town to Liverpool Street (8 min.), the restored midnight express on Saturdays from Liverpool Street to Clacton-on-Sea, &c., and restaurant car expresses on Sundays from Liverpool Street at 11.30 a.m. for Yarmouth and Lowestoft, returning from each place at 3.40 p.m. Further connections and additional trains will be provided on the Harwich branch from Cambridge, on Saturdays, to Yarmouth at 9.56 a.m., returning at 3.45 p.m., and between Norwich and Yarmouth and Lowestoft. A new train from Lincoln at 8.27 p.m. to Retford will give good connections from Great Eastern stations to Sheffield, Manchester, &c.

The 11.15 a.m. from Liverpool, and 12 noon from Manchester, for Yarmouth, will be provided with a restaurant car through from Liverpool instead of from Manchester only. This train, together with the return service from Yarmouth at 12.10 p.m., will run a week later than last year.

Scottish Area.

The North British and Great North of Scotland sections will also share in important accelerations and other developments. The 10.20 a.m. and 2.0 p.m. expresses from Edinburgh to Aberdeen will attach at Dalmeny portions off the 9.40 a.m. from Glasgow to Crail, and the 1.22 p.m. Glasgow to Anstruther, respectively. The pre-war 5.18 p.m. from Glasgow to Dundee will be restored, but will leave Glasgow at 5.40 p.m., running to Thornton Junction only, but connecting at Kirkcaldy with the 10.0 a.m. from King's Cross to Aberdeen. In the reverse direction the 6.15 a.m. and 12.50, 3.40 and 5.45 p.m. trains from Aberdeen will be given services to Glasgow, thus providing equivalents to facilities between Glasgow and the Northern Scottish area hitherto given mainly by the London Midland and Scottish routes.

Several through carriages are to be given to and from the Great North of Scotland section. During June and July a through carriage will be provided on Fridays from Edinburgh to Cruden Bay, continuing to Aberdeen by the 5.38 p.m. express. To meet the need of "Month-end" traffic a through restaurant car express will be run from Edinburgh, Glasgow and Dundee on July 2 and August 1 to Dufftown, Craigellachie, Grantown-on-Spey, Elgin, Lossiemouth, &c. The return services will be given on July 31 and August 31. An additional express train will leave Aberdeen at 7.45 a.m. (taking forward sleeping composite from King's Cross to Lossiemouth by the 8.20 p.m. train, due Aberdeen at 7.30 a.m.), arriving Elgin 9.56 and Lossiemouth 10.20. It will also have direct connection from Elgin to Forres, Nairn and Inverness. An additional express train (with sleeping composite from Lossiemouth to King's Cross) will leave Lossiemouth at 4.5 p.m., Elgin 4.30, arriving Aberdeen at 7.4 in connection with the 7.35 p.m. for King's Cross. It will also have direct connection, via Mulben, from Inverness at 3.35 p.m., calling at Nairn and Forres. There will also be additional trains from Aberdeen at 12.20 p.m. for Ballater, returning at 5.55 p.m., connecting at Aberdeen with the 7.35 p.m. for King's Cross.

Other Developments.

In conjunction with other companies, in addition to items affecting their interests included in the above remarks, a through carriage is to be run on the 8.15 a.m. from Sheffield to Folkestone via Banbury. The return service will leave Folkestone at 10.5 a.m., reaching Sheffield at 5.24 p.m.

The regular train from Weston-super-Mare at 8.48 a.m. for Sheffield will leave at the more convenient time of 11.15 a.m., and be accelerated 34 min. To serve Llandudno a

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through carriage will be run on the 10 a.m. from Newcastle via Leeds, the return service being by the 12.5 p.m. from Llandudno and 4.50 p.m. from Leeds.

In connection with the acceleration of the 11.20 a.m. King's Cross to Edinburgh by 50 min., and to Glasgow by 51 min., the stops at Morpeth, Alnmouth, Chathill and Belford have been deleted, necessitating the running of an additional train from Newcastle to Berwick at 5.53 p.m., the balancing train being the 8.5 p.m. Berwick to Newcastle. To improve the service between Newcastle, Rothbury, Alnwick, &c., through carriages will be run between Newcastle and Rothbury, leaving Newcastle at 1.30 p.m., due Rothbury 3.21 p.m., returning from Rothbury at 4.29 p.m. The service from Newcastle to Rothbury and Alnwick will be improved by 47 min. and 37 min. respectively, and the service from Alnwick by the 2.25 p.m. train will be improved by 35 min.

The 10.30 p.m. York to Sheffield and the Great Central section will stop at Pontefract regularly instead of when required to take up passengers. This will give an additional service for parcels, fruit, fish, &c., from Pontefract to the Great Central section and the south-west. A connection will be given with the 8.40 p.m. from Hull, due Pontefract 9.47 p.m., greatly improving the service for parcels, &c., from Hull to the Great Central section. A through carriage will be run from Hull to Swansea in the service. An additional passenger service York to Pontefract at 10.3 p.m. will also be given. The 1.32 a.m. Sheffield to York will stop at Pontefract when required to set down, and will connect with the 3 a.m. Pontefract to Hull, due 4.47 a.m., giving an additional evening service for passengers, parcels, &c., from the Great Central section and beyond to Pontefract and Hull. A through carriage from Swansea (5.30 p.m.) to Hull will run in the service.

The 9.12 a.m. Peterboro' to King's Cross, which now runs on Mondays and Fridays, will run each weekday, arriving King's Cross at 10.40 a.m. This will give improved connections from Stamford, Essendine, Nottingham and Lincolnshire districts. Four additional services will be given affording improved connections to and from London and the North. The Halifax and Queensbury line, which has been closed on Sundays since the war, will be reopened, and a service of six trains each way provided, giving connections to and from London and the West Riding of Yorkshire.

Sunday Services.

Hitherto we have been concerned mainly with ordinary weekday services, but several items in regard to Sunday facilities need attention, including the following:—Wakefield (Westgate) to Bradford, conveying a through carriage off the 5 p.m. from King's Cross, 7 p.m. Sheffield to Cleethorpes, and 6.25 p.m. Cleethorpes to Manchester, retimed to connect at Retford in both directions with the 5 p.m. from King's Cross, and additional restaurant car expresses between Liverpool Street and Yarmouth and Lowestoft, already mentioned. The 7 p.m. Sheffield to York on Sundays will stop at Burton Salmon at at 2.57 p.m., and run direct to York, instead of via Selby, arriving York at 3.23 p.m. This train will go forward as an additional train York to Darlington and Newcastle at 3.40 p.m. These alterations give a through service from the Great Central section to Darlington and Newcastle, also improving it by 13 min., and giving a new service to Middlesbrough. A new service will be given from the Great Northern section, Hull, Normanton and beyond, and Leeds and beyond, to Darlington and Middlesbrough. A new service will be given from Middlesbrough at 2.15 p.m. to Newcastle and Edinburgh.

There will be additional trains from Middlesbrough to Darlington at 2.15 p.m., connecting with the 3.40 p.m. York to Newcastle, and Darlington to Middlesbrough at 4.45 p.m. The service from Hull to Newcastle will be improved by 48 min., and to north of Newcastle by 35 min. The Selby stop in the 11.30 a.m. from King's Cross will be relieved of all but traffic for Edinburgh and beyond. The afternoon service from Bradford to Hull will be improved by 76 min., and from Hull to Harrogate, Bradford and London Midland and Scottish line by 35 min. The 3.5 p.m. Leeds to York will leave at 2.53 p.m., connecting at York with the above train. The 2.10 p.m. from Normanton to Hull will leave at 3.5 p.m., stopping at Burton Salmon at 3.25 p.m. and giving connection forward to Selby and Hull off the altered 2.7 p.m. from Sheffield (Victoria). The service by the 11.15 a.m. from Edinburgh to Hull will be improved by 3 hours 49 min. The 2.53 p.m. Leeds to Hull will leave at 3.55 p.m., connecting at Selby with the 11.15 a.m. Edinburgh to King's Cross, and due Hull 5.24 p.m. The 1.10 p.m. Hull to Leeds will leave at 1.45 p.m., connecting at Selby with the 8.30 a.m. from King's Cross, which will run to York and connect with the 3.40 p.m. York to Newcastle train mentioned above. The 11.55 a.m. Hull to Normanton will leave at 11.30 a.m. and stop at Burton Salmon instead of Monk Fryston, connecting with the 12.30 p.m. York to Sheffield and Great Central section, which will stop at Burton Salmon. This gives a new service at 11.30 a.m. from Hull

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to the Great Central section, and improves the Hull to King's Cross service by 20 min. By the reinstatement of the 12.33 p.m. from Darlington to Newcastle and the 6.5 p.m. Newcastle to Darlington the pre-war services will be maintained.

The foregoing particulars represent the principal alterations and improvements for the summer months, but numerous others in the local services have also been made, many of them consequent upon the acceleration of, and additions to, the main line services.

The rail petrol motor 'bus at present operating between York and Strensall will work in the neighbourhood of Selby, improving the local services. A larger car will work the York and Strensall service.

OTHER RAILWAYS.

Midland and Great Northern Joint Railway.

All usual facilities will be in operation, including tourist, week-end and day and period excursion arrangements. There will also be the usual through trains to Cromer, Yarmouth, Lowestoft, &c., from the parent systems and lines in connection. A new booklet has been issued, giving particulars of Norfolk holiday resorts served by the joint line. Copies can be had on application at stations on the line, also at London Midland and Scottish and London and North Eastern offices.

"Underground" Railways.

Naturally these lines are not directly concerned with new train services and facilities comparable with those of the main line railways, but to meet the needs of holiday travel, on Saturdays and Sundays, and to some extent during the week, many additions and improvements have been or will be made. Thus, from Sunday, May 6, a considerable number of early trains were added to provide for earlier travel on Sundays. These run from 7.48 a.m. and apply to the Ealing Broadway, Hounslow, South Harrow, Richmond, Putney Bridge and Wimbledon and Inner Circle routes. There are also additional trains throughout the day, the Richmond trains are augmented afternoon and evening, and other trains strengthened, while four trains hourly are supplied from noon onwards between Acton Town and South Acton, and three trains hourly for Uxbridge from 2 p.m. On the "Bakerloo" line the Watford trains have been strengthened from 1.23 p.m., on the "Hampstead" line all trains from 1.51 p.m. and on the Central London Railway all trains from 8 p.m. On weekdays, commencing May 22, three new Richmond trains were added. Additions have also been made in the East Ham services. The 10.40 p.m. (commencing June 6) Ealing-Southend train now leaves at 10.48 p.m. and Charing Cross 11.19 p.m., to the advantage of theatre passengers.

Photo.] **DUBLIN AND SOUTH EASTERN RAILWAY.** [*H. H. Coghlan.*

Train at Shankhill Station. 2-4-2 tank engine, No. 29, "St. Aidan."

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Belfast and County Down Railway.

No special developments are being made in the train services and facilities, but the daily excursion arrangements from Queen's Quay Station, Belfast, may be mentioned. These are given to Newcastle, Castlewellan, Ardglass, Killough, Ballynahinch, Donaghadee and Bangor, and tickets are issued for all classes. Usually several alternative trains are available in both directions, and the general issue is Wednesdays, Saturdays and Sundays. Saturday to Monday, Friday to Monday and weekly combined railway and hotel tickets for the Slieve Donard Hotel, Newcastle, are issued at very reasonable rates. A circular tour is arranged (rail and motor) between Belfast, Donaghadee and Bangor.

Northern Counties Committee (London Midland and Scottish Railway.)

There have been many improvements introduced on this line. The physical lay-out of the Northern Counties Railway rather lends itself to two phases of passenger service. The section of the line between Belfast and Larne is more or less of a residential character, and between Belfast, Portrush and Londonderry it is a mixture of business and tourist traffic.

In February of this year many additional trains were introduced, and a somewhat important feature was the running of suburban express services between Belfast, Carrickfergus, Whitehead and Larne, missing out most of the intermediate stations. Commencing on June 1 most of the trains between Belfast and Londonderry have been materially accelerated. The old arrangement was that a train starting from, say, Londonderry would call at a large number of intermediate stations, such trains stopped at all stations for half the distance between Londonderry and Belfast and for the remainder of the journey they were run express. Under the new arrangement such trains stop only at a few important places, and local intermediate trains have been introduced to pick up the wayside passengers.

Another improvement is the running of a golfers' Saturday restaurant car express from Belfast to Portrush. This train leaves Belfast at 12.15 p.m. and returns from Portrush at 8 p.m. There is also a Sunday express between Belfast and Portrush, leaving Belfast at 9 a.m. and returning from Portrush at 7.20 p.m. These trains occupy about 1 hour 35 min. on the journey, and, having regard to the fact that for half the distance there is only a single line, the speed attained is of a fairly high standard. Arrangements have also been made with the Great Northern Railway (Ireland) to run a through service between Dublin and Portrush from Monday, July 2. The train will leave Dublin at 9.15 a.m., arriving at Portrush at 2.35 p.m. The return train will leave Portrush at 11.55 a.m., due Dublin at 5.20 p.m.

From June 1 combined railway and hotel tickets are being issued from several northern counties stations to Portrush in connection with the company's hotel there. Cheap excursions are in operation to most of the interesting places on the northern counties line, and these are proving fairly popular.

The management is trying to introduce a new note into railway advertising. Instead of overloading handbills, excursion programmes, &c., with too much printing, it is thought better to advertise each feature separately by small card folders, &c.

Other Irish Railways.

Owing to the unsettled conditions in Ireland the Great Southern and Western, Great Northern and Midland Great Western Railways are not making any special developments though standard facilities are provided and additional trains supplied to meet traffic needs.

London Midland & Scottish and Southern Railways.

As we close for press particulars are to hand indicating that the London Midland & Scottish Railway will also include important developments, including a through express service from Penzance and the West of England via Bristol, Hereford and Shrewsbury to Stirling, Perth, Aberdeen and Inverness; acceleration of the 10 a.m., 1.30 p.m. and 11 p.m. Anglo-Scottish expresses from Euston; new through expresses from London to Central and North Wales, also to Blackpool and the Lake District; two new London-Birmingham expresses; day service by the 10 a.m. from Euston to Belfast via Stranraer and Larne; 5.20 p.m. Liverpool to London accelerated; new trains between Liverpool, Manchester, York and Scarborough; through service between Liverpool and Manchester and Cromer, Lowestoft, Yarmouth, etc., via Stoke-on-Trent and Nottingham. There are also important developments in the Midland Division services. These, with other Western Division developments, will receive detailed attention next month.

On the Southern Railway, too, in addition to accelerations and additional services on the Portsmouth line, a number of interesting developments and new facilities will require consideration in our next issue.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition* (1923) *of this standard railway reference work is on sale at 5s. net, or by post from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, 5s. 6d., Overseas, 5s. 8d.*

Horse-power of Locomotives.

We have on many occasions given the formula for ascertaining the horse-power of locomotives. It is based upon the "Tractive Force" formula, which, neglecting friction, is as follows:—

$$T = \frac{D^2 S P}{W}$$

Where D=diameter of cylinder in inches, S=stroke of piston in inches, P=mean effective steam pressure per square inch of piston, and W=diameter of driving wheel in inches. To obtain the indicated horse-power the formula is, therefore:—

$$\frac{D^2 \times S \times P}{W \times 33{,}000} \times V$$

V being the velocity of train in feet per minute. If the speed is expressed in miles per hour the formula becomes:—

$$\frac{D^2 \times S \times P}{W \times 375} \times M$$

M being the velocity of train in miles per hour. From the dimensions of the engines you mention you will be able to calculate the horse-power figures for yourself.

[Reply to "WESTMORELAND."]

The Life of a Locomotive.

A number of the old "Precedent" class locomotives are still used as pilots and for incidental main line duties on the London and North Western Section of the London Midland and Scottish Railway, although, according to the name-plates, some of them date as far back, as you point out, as 1868. How much of the original engine still remains is a moot point, but there are many duties for which an engine of dimensions usual 40 or 50 years ago is quite suitable; hence, the policy of rebuilding them from time to time substantially to the original dimensions, as long as the frames, wheels and certain other parts remain in condition suitable for re-use. For providing assistance to meet a moderate overload beyond the capacity of more modern engines, many of these old locomotives thus meet a traffic need more cheaply and more economically than by the use of a second engine of heavier design.

[Reply to "C. DARLINGTON."]

2-6-2 Engines, London Midland and Scottish Railway.

In further reply Mr. R. H. Coe writes:—Since their removal from the Manchester-Oldham line a few years back these locomotives have been used for shunting and banking purposes, mainly in the Bury and Accrington districts. Since the early part of last summer, however, they have been standing idle in the various sheds in which they are stationed. Several can be seen outside Bury shed in a very woebegone condition. A little while back they were all condemned, but it is now rumoured that the survivors are to be repaired and put to work on the Shap incline of the London & North Western

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section. I understand that they were replaced on the Manchester-Oldham route as they were considered unsafe on passenger trains, one of them having overturned some years ago whilst working a fast passenger train. Moreover, they have never been popular with the men, who much prefer the 2-4-2 tanks.

[Further reply to L. G. J.]

Train Timing.

Mr. Allen has on several occasions outlined his methods. Preferably a stop-watch should be used, as it is difficult to reckon correctly seconds on an ordinary watch and quite impossible to include fifths of seconds. The quarter-mile posts provide distance marks, but the great thing, apart from ascertaining the number of seconds per quarter-mile, from which the actual speed at that point can be calculated, is to know the important changes of gradient, and other places the passing time at which are worth noting. Passing time noted to seconds at stations and other places, if the distances are known, enable journeys to be analysed, quarter-mile times showing the actual speeds. Practice is necessary, however, before trustworthy records can be obtained, as the inaccuracy of a second or even of a fifth of a second, may give results distinctly inaccurate.

[Reply to S. R. F.]

Boiler Horse-Power.

Presumably, you refer to the boiler rating and to the use of ratios of indicated horse-power per unit of heating surface, or matters such as coal consumption per indicated horse-power. Thus, the boiler horse-power per square foot of heating surface would be expressed by the ratio $\frac{A}{B}$, where A represents the weight of water in lbs. evaporated per square foot of heating surface per hour, and B the consumption of steam per indicated horse-power per hour. Obviously, this has no relation to the mechanism of the engine. Hence, the dimensions of the cylinders, whether two, three or four, steam pressure, speed, etc., have no direct bearing, except in so far as they govern the amount of steam required and consequently influence the demand upon the boiler.

[Reply to " GLENDEVON."]

The " Sunny South Special."

This train runs through from Liverpool and Manchester to Eastbourne; and a through composite coach from both Liverpool and Manchester to Ramsgate is also attached, making on normal days a load of seven vehicles. The 12.30 p.m. from Birmingham to Ramsgate, with a through coach for Eastbourne, is attached to the former from Northampton to Willesden, the complete train having generally about 12 vehicles in all. Ten minutes are allowed at Northampton for marshalling the Eastbourne portions in front and the Ramsgate portions in rear, so that the two parts may be got away expeditiously from Willesden. In the northbound direction the two trains are run independently between Willesden and Northampton, where they are again marshalled for their northern destinations.

[Reply to J. C. SEARLS.]

Train Working, Southern Railway.

Your remark that the 4.46 p.m. train from Victoria to Cheam runs via Balham Junction and Crystal Palace is noted as modifying the statement recently made by one of our correspondents that the Willesden Junction-Croydon trains are now the only steam passenger trains which travel by this route. It is also pointed out by several readers that a number of other trains also take this route. We also note further that one of the " Brighton " local sets, after appearing with the letters " S.R." and large numerals, has been re-lettered " L.B.S.C.", the large numerals being retained. Presumably, therefore, arrangements for thus indicating the allocation of sets have not yet been settled as regards the Southern group as a whole.

[Reply to " WOODRIDGE."]

Gradient Profiles.

We have no particulars as to the gradients of the sections you mention, and hardly think them of sufficient interest for us to obtain official information in regard thereto, in that speeds of express trains are not usually specially noteworthy, although the loads may at times and on certain trains be considerable. We note your remarks as to the use of Great Central four-cylinder 4-6-0 express locomotives between Leicester, Nottingham, Sheffield, and Cleethorpes; also that in places these engines do notable fast running, although

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the advertised average speeds on the Cleethorpes section may not suggest anything of special interest.

[Reply to "GAINSBOROUGH" and B. L. SMITH.]

Midland "Single" Locomotives.

Mr. T. G. Hepburn, of Nottingham, in sending a photograph showing one of these engines on the 2.10 p.m. Nottingham train, "which is always loaded up to about eight bogies and several fish vans, and is invariably hauled by a 'single,'" gives the numbers of several of these engines, with their shed, as follows: *Nottingham*, 635, 638, 639, 640 and 641; *Leicester*, 651, 654, 657 and 659; *Kentish Town*, 660, 666, 667 and 668; *Derby*, 600 and 644. He also points out that a London "single" usually works the 1 p.m. down express to Nottingham, returning as pilot to the 5 p.m. up Scotch express, due in St. Pancras at 7.15 p.m.

[Further reply to E. HUXTON.]

Lickey Incline.

Seeing that Midland "single" locomotives are still used on the Bristol-Birmingham main line, there is nothing remarkable in the fact that such an engine ascended the Lickey incline, bearing in mind that it was assisted by an 0-6-4 tank engine attached in front at Bromsgrove, in addition to a "banker" as usual. Otherwise, the route in question is one which presents no particular difficulty to an engine of this type, providing that the load is not excessive. The 4-6-4 tank engines you noted at Burton would be those of the Tilbury type, though we were not aware of any being at Burton.

[Reply to C. HAMMOND.]

London and North Eastern Pacifics.

Now that a number of the Great Northern "Pacifics" are in service, they may be seen on various trains. We cannot give particulars of engine stations or engine turns, as these may be changed at any time, and such information thus be rendered inaccurate before publication occurs. So far we know of only two North-Eastern "Pacifics" in service. Particulars of weight as given in the January 1923, number are correct. Those given in July, 1922, were estimated before the engine was completed.

[Reply to F. H. HUNNARD and R.B.E.]

"John Hick" Locomotives, London and North Western Railway.

All of these engines have, of course, long since been scrapped. Although it is against our general rule to give lists of names and numbers, as the matter is one of historic interest they are stated as follows:—

No.	Name.
20 ..	*John Hick.*
1505 ..	*Richard Arkwright.*
1512 ..	*Henry Cort.*
1534 ..	*William Froude.*
1535 ..	*Henry Maudslay.*
1536 ..	*Hugh Myddelton.*
1548 ..	*John Penn.*
1549 ..	*John Rennie.*
1557 ..	*Thomas Savery.*
1559 ..	*William Siemens.*

[Reply to H. CLUBLY.]

Great Western "Star" *v.* London Midland and Scottish "Claughton" Class 4-6-0's.

We have no authentic information as to the relative coal consumption of the two types. You are correct in assuming that the actual degree of superheat is higher on the latter than on the former class, but the 225 lb. working pressure of the Great Western engines as against the 180 lb. of the other type means that the steam in the steam-pipe of the Great Western Railway engine is at a considerably higher temperature when leaving the boiler than that of the "Claughton," so that a lesser degree of "added heat," or superheat, is required.

[Reply to E. R. G.]

The "Fairfield."

Your correction is noted that the rail motor car illustrated on page 451 of the June number and described on page 501, was not the "Fairfield" but probably the "Little Wonder," the "Fairfield" having been constructed for the broad gauge and used on the Tiverton branch of the Bristol and Exeter Railway. The description given on page 501 was reproduced as published by *The Illustrated London News*, hence it is by no means improbable that the dimensions quoted do not agree entirely with those appearing elsewhere.

[Reply to G. H. and others.]

Second-Class Accommodation.

Although not given in collective form, the dates when second-class accommodation was discontinued on most railways

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are mentioned incidentally in different parts of the RAILWAY YEAR BOOK. Now that the Welsh and Isle of Wight railways have discontinued the second-class, the only railways we can call to mind which still provide for three classes are the South Eastern and Chatham, North London, and one or two other small lines, apart from the Irish railways, where three classes are still provided on most systems.

[Reply to H. HAMMETT.]

The Great Western Record Run.

You are correct in pointing out that, although press references to the famous high-speed run on the Great Western Railway suggest that the particulars were made public for the first time in the *Great Western Railway Magazine* for November, 1922, practically all the data was given years ago in the June, 1904, and June, 1906, numbers of THE RAILWAY MAGAZINE. This matter was, in fact, commented upon in our December, 1922, issue.

[Reply to W. C. WHITE.]

Great Central Trains at Paddington.

Before the London extension was completed, Great Central goods and, occasionally, passenger trains worked from Aylesbury to London over the Great Western Railway, and the engines could sometimes be seen at Westbourne Park, where the Great Western London sheds were then located. The Great Western and Great Central Joint line is still managed by a joint committee, except that the London and North Eastern Railway replaces the Great Central Railway.

[Reply to J. BLACK.]

Aylesbury and Oxford Tramroad.

Both this line (now included in the Metropolitan and Great Central Joint Railway) and the Wantage Tramway have been described in the pages of THE RAILWAY MAGAZINE, though, in neither case, recently, while copies are now out of print. The former scheme is now represented by the branch from Quainton Road to Brill. The latter is a small line, still independent, opened in 1875. Its length is 2½ miles, and it possesses three locomotives and three coaching vehicles.

[Reply to "WYCOMBE-ITE."]

Locomotive Failures.

We do not quite appreciate your "jubilation" at the failure of one of the Great Northern "Pacifics" on a recent occasion. Obviously, even the best of engines is liable at times to get into difficulties, while the particulars given by you suggest that a breakdown of some kind had occurred. The fact that the engine had managed to reach the terminus under the circumstances was rather to the credit of its design, or to its handling by the enginemen, or both.

[Reply to H. T. L. C.]

Coal Traffic in South Wales.

On some sections of the mineral lines in South Wales trains are run permissively, that is, after being duly warned, one train is allowed to enter a section and to proceed close behind a train in front. We are not aware, however, that, either during the war or since, this method was or is adopted, except on level sections and when approaching yards and sorting sidings, and then only on lines where no passenger trains are run.

[Reply to "KEEN."]

Appearance of Locomotives.

There may be something in your suggestion that one reason for painting over bright copper or brass chimney caps in the case of engines having high-pitched boilers, is that, at times, reflection of the sun therein is dazzling to a driver. As a rule, however, a principal reason for painting over is to save the labour involved in cleaning and polishing. The other points raised by you are noted and will be borne in mind.

[Reply to E. RAINCROFT.]

Three-Spectacle Signals, East London Railway.

Three spectacles, two red and one green, are fitted to electrically-operated semaphore signals on this line, the idea being that the green indication is not given until the arm has fallen almost to its extreme position, red showing during the lowering movement, and there being no dark intermediate stage. We know of no other place where this arrangement is adopted.

[Reply to V. B.]

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"Pacific" Locomotives.

You are correct in pointing out that in both the Great Northern and the North Eastern 4-6-2 locomotives the three cylinders drive on to one axle, though, in the one case, it is the leading coupled axle, and, in the other, the second. The error to which you direct attention has already been corrected, though your distance from England has probably prevented your seeing it by the date of your letter.

[Reply to J. D. THOMSON.]

Locomotive Blast.

Too technical a subject to discuss here. In the relative efficiency of draught a great many factors other than those of mere chimney diameter play an important part. We are not given to understand that the reduced diameter of the new Great Western Railway standard chimney has been accompanied by any radical modification of the blast arrangements, or of the dimensions of blast pipe and orifice.

[Reply to E. R. G.]

Brighton Railway Tunnels.

You are probably correct in stating that the length of Patcham Tunnel is 580 yards, but we have no more detailed information. It is not usual for train times to be reckoned from the mouth of a tunnel unless it marks a point where an important change of gradient occurs. We have, therefore, no knowledge of any records of times from the north end of Balcombe Tunnel to Earlswood station.

[Reply to C. E. BEAMES.]

Hammersmith and City Railway.

Great Western Railway electric rolling-stock is that used for Hammersmith and City traffic, but includes only the Great Western share, the remainder being comprised in Metropolitan statistics. Actual figures are therefore: 40 motor-cars and 80 trailer cars, Metropolitan and Great Western Joint Stock. Central London rolling-stock is used on the Ealing and Shepherd's Bush line.

[Reply to J. E. C.]

Goods Engines on Express Trains.

It is by no means unusual for 0-6-0 goods engines to be used for working express trains, but, obviously, their relatively small coupled wheels and their characteristics of design render them unsuitable for such duties regularly, for which reason they would necessarily be liable to be heavy on repairs if systematically used for this traffic.

[Reply to C. K. DOUGLAS.]

Railway Fares.

In cases where no reduction was made on January 1, or the reduction was less than the anticipated amount, the corresponding pre-war fares were appreciably less than those which the company was entitled to charge on the basis of mileage, &c. This accounts for a number of apparent anomalies.

[Reply to C. E. BEAMES.]

Indicator Shelters.

The screen you have noted fitted round the front of a North Staffordshire locomotive is provided to enable observers to take indicator diagrams and conduct other trials while the engine is travelling. These screens, which vary in design on different railways, are fitted to whatever engine is under special observation.

[Reply to J. G. FETZER.]

Flash-Light Signal at King's Cross.

The flashing signal at the end of No. 14 platform (King's Cross Suburban) was installed for observation purposes. We understand that it was never in actual use, and that it is not intended to adopt this type of signal, at any rate at this location.

[Reply to A. S. CANTWELL.]

Factor of Adhesion.

Presumably you refer to what is generally described as the "coefficient of adhesion," giving the proportion of the adhesion weight to which tractive effort can be utilised without causing slipping. This may vary between $\frac{1}{3}$ and $\frac{1}{10}$, but about $\frac{1}{4}$ is a good average value.

[Reply to "BRER FOX," Manchester.]

Spring-Buffered Goods Wagons.

All goods and mineral wagons employed in ordinary traffic now have to be fitted with spring buffers. Dumb-buffered wagons are, however, still used to some extent for ballast trains and for use about railway yards, providing they are not run in regular traffic trains.

[Reply to T. W. SNASHALL.]

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Great Central Locomotives.

Previous reply given in the May number. Reference was made particularly to 4-4-0 locomotives, of which the "Director" and "Improved Director" classes are the most up-to-date. The four-cylinder 4-6-0 locomotives represent the latest development of the 4-6-0 designs.

[Reply to F. H. HUNNARD.]

No. 990, Great Northern Railway.

This engine, the first of Mr. Ivatt's original and smaller "Atlantics" bore, and we believe still bears, the name *Henry Oakley*, after Sir Henry Oakley, a late and famous general manager. The "251" class constitute the large-boiler development of the "990" series.

[Reply to A. C.]

Somerset and Dorset Joint Railway.

As long as this line is separately organised it will, presumably, retain its present title. The matter is not affected by the fact that it is now associated with the London Midland and Scottish and Southern Railways instead of the Midland and London and South Western lines.

[Reply to "WESTERNER."]

London and North Eastern (North Eastern) Coaching Stock.

Letters "N.G." in an oval cast-iron plate on the sole-bar of coaching vehicles of this railway indicates that they are equipped with a modification of the brake-gear, introduced on this railway some time ago; the actual meaning is "New Gear."

[Reply to K. W. S. M.]

Engine Sheds, London and North Eastern Railway.

Particulars of the district or shed numbers of the Great Eastern section of the London and North Eastern Railway, together with those of many other lines, are given in the RAILWAY YEAR BOOK, 1923.

[Reply to C. K. DOUGLAS.]

Through Working in the South.

Although you may have seen London and South Western rolling-stock employed for a "Brighton" train, it is more probable that the train you noted was one of those running between Brighton and the South Western system.

[Reply to C. F. Fox.]

Great Northern "Single" Locomotives.

All of these have been scrapped, with the exception that the shell of No. 1 is preserved at King's Cross locomotive sheds, which fact enabled No. 1000, the first of the three-cylinder 2-6-0 locomotives, to be photographed alongside it.

[Reply to A. C.]

Engine Working, Waterloo to Exeter.

The arrangement whereby one engine, works through from Waterloo to Exeter on the 11. a.m. down train is adopted for convenience of working. In the absence of water-troughs the journey could not be made without stop.

[Reply to J. H. SUTCLIFFE.]

French Locomotives.

As a general principle we do not give dimensions of locomotives considered in this section. Dimensions of several classes in use in France are, however, included in "Pertinent Paragraphs," and these will give some of the information you desire.

[Reply to A. N. L. MACLACHLAN.]

The First "Railway Magazine."

We are obliged for cuttings enclosed by you. The original RAILWAY MAGAZINE in 1839 became *Herapath's Railway Journal*. It was mainly concerned with railway finance.

[Reply to J. D. THOMSON.]

Brake-power.

With modern brake-power it should be possible without difficulty to pull up a 250-ton express travelling at 60 m.p.h. in ¼-mile, and with some of the high-pressure brakes now employed in an even shorter distance.

[Reply to "CURIOUS."]

Gresley-type Top-feed.

Double domes on certain London and North Eastern (Great Northern section) 0-6-0 and 2-8-0 engines enclose both the regulator and a top-feed arrangement of Mr. H. N. Gresley's design. Of these, 0-6-0 No. 574 is one.

[Reply to J. A. DANE.]

Scottish Engine Headlights.

Only the Caledonian engines carry headlights on the cab-sides, among Scottish railways, and these are not in addition to the ordinary head-codes, but in place of them.

[Reply to L. A. J.]

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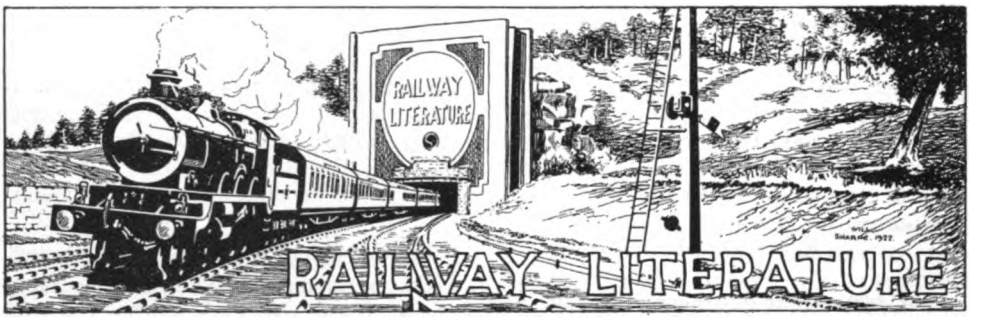

THE RAILWAYS OF SPAIN. By Geo. L. Boag. [*The Railway Gazette*, 33, Tothill Street, Westminster, London, S.W.1. [Price 12*s*. net.]

The fact that so little has hitherto been published in English in regard to the railways of Spain would in itself entirely justify the publication of this volume. As will be seen, however, besides filling what has been a serious gap in the literature of the world's railways, the manner in which information has been collected and is now presented is to be commended. The author is well known as an officer of long experience in charge of a leading Spanish railway, and his *Manual of Railway Statistics* is regarded as a standard work. Bound in cloth, printed on good paper, and with an attractive selection of photographic and line illustrations, together with several tabular statements on folding plates, this volume contains a large amount of historical, statistical and operating data which should prove exceptionally useful for reference purposes. In Chapter I Mr. Boag deals with the origin and development of Spanish railways and their relations with the Government. He then describes the principal lines and traffic routes, reviewing the chief characteristics of train services, train speeds, and station design, layout and accommodation for passengers and for dealing with merchandise traffic. Chapter III is concerned with organisation and staff aspects, including consideration of rates of pay, pension, sick and provident funds, ambulance work, &c. This is followed by a chapter dealing with statistics and accounts, including comparisons with railways in other countries, while rates and fares and other charges are considered in Chapter V. Permanent-way, signals and rolling-stock receive attention in Chapter VI, while Chapter VII discusses the Spanish railway problem in general, the future of the railways, Government intervention and nationalisation.

Although the title of the volume indicates only its reference to Spanish railways, an important addition is a chapter dealing with the railways of Portugal, in regard to which also, there is distinct need for an authoritative work. An abridged translation of the Railway Law of Spain of November 23, 1877, is given as an appendix, while another appendix summarises particulars of the principal railways in Spain worked by British companies. A bibliography, mainly of Spanish works, concludes a volume which should be perused by all who are interested either in Spanish and Portuguese railways or in the history, statistics, operation and material of the world's railways in general. The illustrations number 36, including maps, views of bridges, stations, trains, locomotives, passenger carriages, &c., together with diagrams, tables and technical drawings.

THE ELECTRICAL HANDLING OF MATERIALS. By H. H. Broughton, M.I.Mech.E., M.I.E.E. etc. [Benn Brothers, 8, Bouverie Street, LONDON, E.C.4. Price 50*s*. net.]

This is the fourth and concluding volume of a manual on the design, construction and application of cranes, conveyors, hoists and elevators, which should prove invaluable to all concerned with the design and installation of material-handling plant, and in continual reference wherever such equipment is used, or its possibilities and economies are being explored. The present volume is concerned with machinery and methods, developed upon the basis of its predecessors which dealt respectively with electrical equipment, structural steelwork and mechanical equipment, and cranes and crane mechanisms. The work as a whole deals very thoroughly with British practice, but also describes many appliances of American and Continental origin, particularly in reference to the handling of iron ore, grain, and other applications where practice has been developed to a notable degree in view of the large scale of operations. The chapter headings well indicate the subject matter: elevators and conveyors, belt conveyors, automatic feeders, automatic skip-hoists, bulk-handling in America, handling and storage of grain, suction system of discharging grain, handling and storing of coal, ore and similar bulk materials, belt-shipping

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plants, the Panama Canal coaling stations, and the handling of foodstuffs and general merchandise. The volume is well-produced, on art paper, printed in clear type with numerous tables and much statistical data, while the 279 illustrations, drawings and half-tone should be of great use. Many examples from railway practice are included.

LOCOMOTIVES OF THE LONDON, BRIGHTON AND SOUTH COAST RAILWAY. [Compiled and published by W. G. Tilling, 106, Great Dover Street, London, S.E.1. Price 2*s.* 6*d.* net. By post, 2s. 8d.]

This is the second edition of a well-produced booklet which, judging from the reception given to the first edition, will be widely appreciated by a large number of our readers. Dated May 1, 1923, it covers all the locomotives of the London, Brighton and South Coast Railway to date, and may, therefore, be regarded as a final record of the "Brighton" locomotive stock prior to incorporation in the Southern Railway. Among the new features are particulars of London, Brighton and South Coast Railway locomotives which served in France, one of these engines being illustrated, we understand, for the first time. There are also new particulars of engines scrapped and sold. An interesting series of illustrations is included, the frontispiece being a very fine view of No. 333, *Remembrance*, while other views of a new character are those of the rebuilt 4-4-0 engine No. 55, and of No. 206, rebuilt 4-4-0, fitted with a second dome in connection with the top feed equipment. The book is on sale at the offices of the RAILWAY MAGAZINE, 33, Tothill Street, London, S.W.1.

ELECTRIC CRANES AND HAULING MACHINES. By F. E. Chilton, A.M.I.E.E. [London: Sir Isaac Pitman & Sons, Limited, Parker Street, Kingsway, W.C.2. Price 2s. 6d. net.]

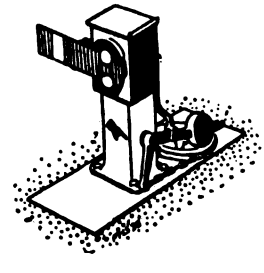
This is one of Pitman's technical primers and describes the construction and operation of modern cranes, transporters, capstans, winches, haulages, winding gear, &c., and their principal accessories for works and railway officials, engineers, operators and students. The contents of the book refer only to the most modern and commonly used appliances. The author points out that, as labour-saving machines, electric cranes and winches are operated at the highest possible speeds consistent with usefulness and safety, efficient control is of the utmost importance. Provided with suitable speed-regulating switches and reliable brakes, the skilled driver can use his machine with a high degree of speed and precision. A generation ago it was not thought electricity would ever become a serious rival of hydraulic power for the driving of heavy machinery such as used in dock, railway and general industrial service, but the change has come and Mr. Chilton's book is a useful contribution to the literature on the subject.

BARTHOLOMEW'S GENERAL MAP OF IRELAND. [John Bartholomew & Son, Ltd., The Geographical Institute, Duncan Street, Edinburgh. 30 in. × 24 in., folded in cover. Price 1s. 6d. net, paper; cloth, 3s.; on cloth mounted on rollers and varnished, 7s. 6d.]

This re-issue of the publishers' well-known tourist's map of Ireland will be welcomed by all interested in Irish affairs, and no doubt in due course will be appreciated once more for its tourist value. It is essentially a road map, for which suitable colours are used, but the railways and geographical features are well indicated, while the size is sufficient to render reference easy and convenient.

PLAN OF DUBLIN. [John Bartholomew & Son, Ltd., The Geographical Institute, Duncan Street, Edinburgh. Price, on paper, 9*d.* net; cloth, 1*s.* 6*d.* net.]

This handy map, 19 in. by 15 in., folding to convenient pocket size, shows the lay-out of the city of Dublin, the various railways and their connections being clearly indicated. It will be specially appreciated by visitors to Dublin.



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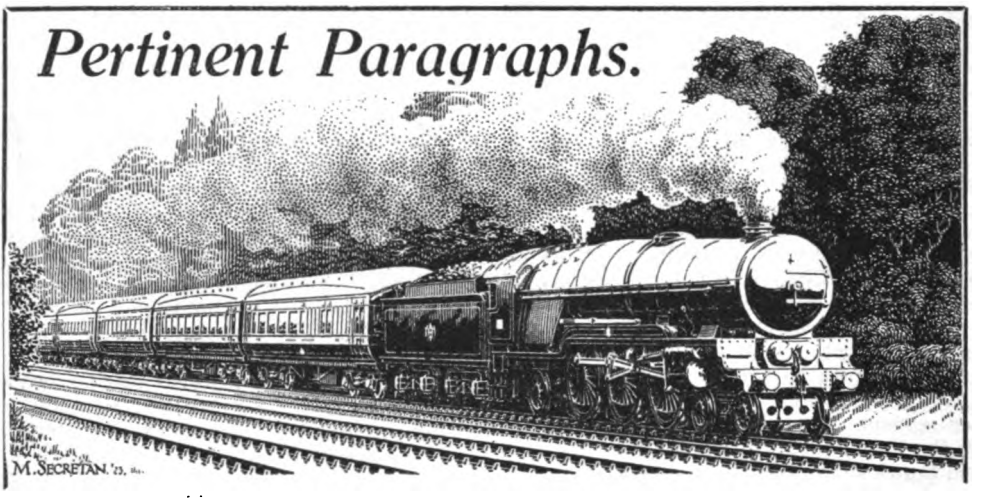
Pertinent Paragraphs.



Make-up of Trains.

ONE of our readers, Mr. W. T. Allen, sends some pertinent remarks concerning the apparently "wasteful" manner in which express trains on certain routes are made up, his main point being that, were other methods adopted, the loads of some of these trains could be kept within limits which would enable them to be worked by one engine, whereas, under present conditions, certain of them require pilot assistance to be regularly given. His comments are based principally upon the fact that certain of the evening dining car expresses, such as those between London and Liverpool, Manchester, &c., frequently include from two to five dining saloons. In view of the fact that many ordinary expresses manage with one or, at most, two dining cars in a train of from 10 to 14 vehicles, this does suggest undue increase in the weights to be hauled. We would point out, however, that trains such as those mentioned are primarily used by business people, many of whom travel regularly, and, in practice, tend to partake somewhat of the nature of a travelling club. Hence, it is found desirable to provide extensive dining car accommodation, so that it is not necessary to serve meals in relays, passengers being thus enabled to retain their seats throughout the journey, frequently forming parties of business acquaintances for whom tables are regularly reserved. In view of the importance of the traffic represented by these frequent or regular business journeys, it can easily be understood that it is good policy on the part of the railway companies to provide accommodation accordingly, though, theoretically, it should be practicable to meet the requirements of both regular and casual passengers by serving meals in relays from one or, at most, two cars. It must be remembered that, even were two cars used instead of four or five, it would still be necessary to provide at least one additional compartment vehicle to give sufficient seating accommodation for the passengers while they were not occupying the dining cars.

"Piloting" and Train Loading.

THE fact that so many trains, owing to their great weight, now require to be piloted on the London & North Western section of the London Midland & Scottish Railway is also commented upon. With so many engines rendering pilot assistance, obviously there must be fairly frequent occasions when a second engine is attached to a relatively light train for return working. Mr. Allen also remarks upon the heavy loading of some of the night West Coast trains, and suggests that a degree of slowing-up would avoid the need for running two engines, while the later arrival in London, Edinburgh or Glasgow would not seriously incommode passengers. This reasoning may be correct in theory, but even for night journeys passengers usually expect to be conveyed with reasonable rapidity, while it is often necessary to consider connections at destination. There is also the matter of leaving the departure time as late as possible. In addition, there are circumstances where Anglo-Scottish trains from London need to be given reasonably fast services to Edinburgh or Glasgow because of the fact that they also convey through vehicles for Perth and Aberdeen, whose time of arrival does not permit of delay due to slower running. Instances such as those commented upon serve to

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indicate the fact that it is not sufficient to provide train services suited to the conditions of one particular section of traffic, but that in most cases a number of travel requirements have to be correlated.

Accident Inquiries in 1922.

DURING the year 1922 there were 27 inquiries into railway accidents as compared with 18 in 1921, 25 in 1920, 30 in 1919, 69 in the five war years 1914–1918, and 30 in 1913. The 27 accidents in 1922 included 15 train collisions, 2 buffer-stop collisions, 5 derailments and 5 locomotive failures. Of the 15 collisions, 6 were due to drivers passing signals at "danger" in clear weather, and 2 to this being done during fog. One collision arose through a signal being frozen in the "clear" position. Irregular block working by the man in advance caused one accident, and by the man in the rear, during fog another. Wagons on the main line were overlooked in one case, and the signalman changed the points as the train was approaching and turned it on to a light engine in another. There was one collision between the two portions of a divided goods train and one where some wagons, not securely braked, ran forward into their own engine. The buffer-stop collisions were both due to errors of judgment. Of the 5 derailments, 3 were caused by the permanent way being defective; one by a failure of signalling apparatus; and one to four-wheeled vehicles being placed in front of heavier stock. The 5 locomotive failures were: connecting rods, 3; tender step, 1; crank axle, 1.

Predisposing Causes of Accidents.

THE fatal collision some time ago at Retford, on the London and North Eastern Railway, between the up Aberdeen sleeping-car express and a goods train provides a notable example of the fact that most collisions on railways spring from the combination of two or more mistakes, each of little account by itself, but together, producing a condition that results in an accident. In the case under review, the goods train had a cattle wagon for Kiveton Park (Great Central Section). The porter at Decoy Sidings, Doncaster, did not know the junction for Kiveton Park, and presuming it to be Peterborough, telegraphed the information to that station. The telegram should have been sent to Retford, at which place the goods train was not booked to call. The signalman at Retford therefore, did not receive the intimation that the train would stop there sufficiently early to turn it into the goods loop, but provided for the usual through run on the up main line. The driver, knowing he had to stop to detach the wagon, stopped at the station, but he had omitted to give the requisite "crow" at a previous signal box, to indicate that he was going to detach. This second mistake also accounted for the train arriving at Retford on the up through line, instead of being diverted to the platform line loop. Had either the telegram been despatched to the right station, or the "crow" been given, the goods train would have been diverted from the main line, which would have been clear for the express, and the signal would have been off for the latter; consequently the express would not have passed them at danger with fatal results to the three men on the footplate.

Central Buffer Railway Coaches.

THE central buffer railway carriage without automatic couplings is by no means new to British railway practice. Many years ago, the old South Eastern Railway introduced close-coupled bogie trains of this type for suburban services. Not only were the vehicles a great advance on the suburban rolling-stock then in use on the line, but the design included several innovations. The end vehicles were each fitted with the usual pair of long buffers at one end, all other buffers being of the central type. The third-class coaches had eight compartments and seated 80 passengers; the compartments were in pairs, *i.e.*, each alternative partition was only carried about 3 ft. above the seat. They weighed 20 tons each, and therefore formed an economical type of coach so far as weight is concerned, coming midway between the five-compartment (50 seats) four-wheeled coach weighing 10 tons and the new 10-compartment (100 seats) bogie third-class coach weighing 30 tons.

Although built for suburban service, we remember, about 36 years ago, travelling to Hastings in one of these trains—a relief portion to an ordinary fast train. The coaches measured about 42 ft. over head stocks. Several now form most of set trains Nos. 398 to 402, employed for excursion and suburban traffic. These trains were amongst the earliest bogie coaches owned by the South Eastern Railway, but they were by no means the first eight-wheeled vehicles on that railway, such vehicles having been in regular use on the South Eastern Railway since 1850 or possibly earlier.

Improved Accommodation on New Services.

WHEN a new competitive railway is opened, or a new train service is operated for the same purpose, a bid is usually made for public support by introducing innovations in the coaches. A feature of the late Great Central Railway service on the opening of the London extension was the inclusion of

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restaurant cars in all express trains. Some of these cars were further distinguished by having no doors directly communicating with the station platforms or permanent way. Entrance to, and egress from, these cars could only be obtained through the corridor connections with adjoining coaches at each end. When in April, 1878, the London, Chatham and Dover Railway commenced to run the daily "Granville Express," new rolling-stock was provided—six-wheeled coaches in place of four-wheeled vehicles. The exteriors of the coach bodies also differed considerably from standard London, Chatham and Dover Railway practice. The teak panels were in one piece (or butt jointed) instead of vertical boards with the joints covered by beading. The opening of the Great Northern Railway from London was responsible for the introduction of the teak railway coach, which therefore was the innovation in passenger rolling-stock chosen by the Great Northern Railway to signalise its entry into competitive services between London and the north. How popular the teak (or imitation teak on some lines) railway carriage became, will be known to our readers. At least 10 important railways 15 years ago had their passenger rolling-stock this colour.

The Teak Railway Carriage.

THE Great Northern Railway was opened from London to Peterborough, August 5, 1850, when its innovation of teak railway coaches attracted great attention. The leading railway journal of the period described them under the caption "The Peculiarity of the Carriages," the opening sentences of the article reading: "The carriages are most peculiar in their appearance. At first sight a stranger would hardly know what to make of them, whether they were in a perfectly finished state or not. But on a little closer inspection he would soon discover his mistake. They are made of an Indian wood called 'teak.'" The carriages were more commodious than those of other railways—a man 6 ft. in height could stand upright in them, the ventilation was better, and the carriage windows were raised and lowered by springs instead of the usual leather strap. This last improvement was not used in the more modern carriages of the Great Northern Railway, which were provided with the usual straps. Finally, each coach cost £40 less than those painted and decorated in the flamboyant style usual for exteriors 70 years ago. That the teak coach commended itself to other railways associated with the late Great Northern Railway is evident by it being adopted as standard for the East Coast Joint Stock. The other partners in this route had their own coaches painted lake and red-brown respectively.

Open Second Class Coaches and 6d. Minimum Fares.

WHILST on the subject of the early days of the Great Northern Railway, it is of interest to recall that its Act of 1850, which fixed fares and rates, contains some peculiar enactments. When the Great Northern Railway was promoted it was deemed necessary (for the purpose of obtaining Parliamentary sanction) to include in its Bill a very low schedule of fares, &c. This Act was obtained in 1847. The fares were :—2d. per mile first class; 1½d. per mile second class; and 1d. per mile third class. "The second-class carriages to be closed and have glass windows, the third-class carriages to be covered and have seats, and the company shall run third-class trains every day, as often and upon such conditions as the Commissioners of Railways shall prescribe." It was also enacted that the distances on which fares and rates were to be charged should be "the direct geographical distance, as measured on the Ordnance Map and not the distance according to the length of the railway."

The Great Northern Railway sought in its Bill of 1850 to repeal all these restrictions and to charge fares :—3d. per mile first class; 2d. second class; and 1½d. third class. The company was successful in obtaining powers to charge higher fares, but if the maximum second- and third-class fares were charged, the provisos mentioned above were to remain in force. Further, the Act of 1850 authorised 6d. as the minimum fare for any distance—a mile for instance—and also, with regard to first- and second-class fares, that they should increase by 6d., *i.e.*, cheapest fare 6d., next fare 1s., and so on, 1s. 6d., 2s., 2s. 6d., &c.

It appears peculiar to us that, as late as 1850, when the Parliamentary Trains Act had been in force six years, that a railway should seek to be in a position to use second-class open carriages and third-class coaches without seats and roofs. Apparently, the lower fares that would have had to have been accepted if this archaic accommodation were provided made the Great Northern Railway "consider the game was not worth the candle."

Fares Computed on Straight Line Distances.

IN the days before road motor services, railways might have obtained much unremunerative traffic had the charging clause in the Act incorporating the Great Northern Railway been general. As already intimated this required fares and rates to be charged

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on the mileage of a straight line drawn between any two stations. What cheap fares for instance, would have obtained between coast towns, served by branches, each 6 to 12 miles in length from main lines, thrown off at few miles intervals, such as Fowey to Looe, 25½ miles by Great Westen Railway and only 8 miles as the crow flies; Yealmpton to Dartmouth, 56½ miles by railway, with changes at Mutley and Newton Abbot against eleven direct; Seaton to Sidmouth, 24 and 7 miles respectively by rail and air, and West Bay to Abbotsbury, where the distances are 29¾ miles by rail and 7½ miles by bee line. Bude to Bideford is 83¼ miles by railway, but only 19 miles across country. Each pair of places we have quoted is on the same railway (either Great Western or Southern), but by combining the two systems even greater discrepancies exist between the railway and the direct distances between pairs of coast towns in the West of England. Newquay (Great Western) to Padstow (Southern) means a railway journey of 45 miles, *via* Par and Bodmin Road to Wadebridge on the Great Western Railway and thence by the Southern Railway, a matter of 11 miles is the distance in a straight line. Lynton (Southern) to Minehead (Great Western) involves a railway journey with changes at Barnstaple (to Great Western), and Taunton, the distance being 90¾ miles; the coast road is about 20 miles long, but this is by no means direct, as it is but 16 miles by aeroplane.

Similar examples could be found all round the coast of Great Britain, whilst they are numerous in the interior. Alston to Wearhead—both on the old North Eastern Railway, are only 7½ miles apart, but to go by railway means a *detour* through Scotswood and Wear Valley Junction—a matter of some 99½ miles. In the Lake District, we find that a railway journey from Coniston to Windermere, necessitates travelling *via* Foxfield, Arnside and Oxenholme, about 63 miles, whilst a bee line is but a matter of 6½ miles. If, in the Peak District, one desires to travel by rail from Edale on the old Midland Railway to Woodhead on the late Great Central system, the distance across country is about eight miles, but by rail, we must take a horse-shoe journey of 41½ miles *via* Sheffield. Such journeys are by no means confined to hilly country. In Lincolnshire, for instance, from Woodhall Junction to Digby is seven miles direct, but 22½ miles by railway, *via* Lincoln.

Mostly, these circuitous routes have arisen haphazardly, branch lines to various destinations being built from junctions without any idea of intercommunication, and therefore, being laid in approximately parallel directions. The line to Largs on the late Glasgow and South Western Railway is not, however, of this character; the route from Glasgow runs down to the coast at Ardrossan and then turns northward and continues to Largs, with the result that from Kilburnie to Largs is 24 miles by railway, whilst direct it is about 9 miles.

Competition on Indian Railways.

THE REV. W. MACHIN, of Lucknow, India, writes as follows: "Recently signs have been perceptible of the reappearance of competition between Indian railways. A striking example has now made its appearance. There are two routes from Calcutta to Bombay, one by the East Indian Railway via the Grand Chord line, and Jubbulpore, thence over the Great Indian Peninsula Railway via Itarsi Junction. The distance is 1,347 miles, with 33 stops, and the time taken 42 hours 39 min. From Manikper to Itarsi, 319 miles, and from Maumad to Kalyan, 139 miles, the gradients are stiff, and curves are frequent. On the easier portions of the line the speed is from 40 to 45 miles per hour, start to stop; 657 miles of the line are single track.

"The other route is via Nagpur over the Bengal-Nagpur Railway, thence over the Great Indian Peninsula Railway via Bhusaval, 187 miles south-west of Itarsi on the main line, a total of 1,223 miles, of which the middle portion through the Central Provinces, as well as Maumad to Kalyan, is hilly, but the routes are not very different in this respect. Of this route 875 miles are single track. The time taken is at present 45 hours 54 min.

"The Bengal-Nagpur Railway, however, now announces a cut of 6 hours 25 min. on the journey from Calcutta to Bombay, and 2 hours 51 min. on the reverse journey. These cuts take effect from Sept. 1. The detailed timetable is not yet out (August 18), but probably some of the 53 stops have been cut out, as well as adopting accelerated running. It will be seen that this is a direct challenge to the East Indian Railway, and it remains to be seen if the latter will take up the gauntlet."

French Locomotives.

IN answer to queries raised by Mr. J. Macartney Robbins, Monsieur G. Vuillet, one of our readers in Paris, has kindly supplied information at considerable length, much of which will be of general interest and is, therefore, given here in greater detail than would be possible in "The Why and the Wherefore" section.

With regard to the inquiry as to the two-cylinder "Pacific" locomotives of the Paris-Orleans Railway, Monsieur Vuillet mentions that the class was illustrated and technically described in our contemporary, the *Loco-*

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motive Magazine, for January 15, 1922. These engines were built by the American Locomotive Co., on plans supplied by the railway company and are of better workmanship than is usually the case with American-built locomotives. The pioneer of the class came out towards the end of June, 1921. They are numbered 3591-3640. These engines are different from the Midi 4-6-2 two-cylinder "Simple" type, which are built on purely French lines by the Société Alsacienne de Constructions Mecaniques. The Midi engines are slightly smaller. A detailed description, with photographs and folding line drawing, of the Midi locomotive appeared in the *Revue Generale des Chemins de Fer* for November, 1921. Leading dimensions of the two classes mentioned, together with those of the corresponding "Compound" 4-6-2 locomotives of the Paris-Orleans Railway, are as follows :—

	4-6-2 Compound P.-O. Railway 3521-3590 Series.	4-6-2 Simple P.-O. Railway 3591–3640 Series.	4-6-2 Simple Midi Railway 3101–3120 Series.
Cylinders	16¾ in. and 25¾ in. × 26 in.	24¾ in. × 26 in.	25¼ in. × 26 in.
Coupled wheels, diameter	6 ft. 3 in.	6 ft. 3 in.	6 ft. 3 in.
Bogie wheels ,,	3 ft.	3 ft.	2 ft. 9 in.
Trailing wheels, ,,	3 ft. 6 in.	3 ft. 9 in.	3 ft. 9 in.
Total wheelbase	35 ft.	37 ft.	35 ft.
Steam pressure	227 lb. per sq. in.	170 lb. per sq. in	185 lb. per sq. in.
Heating surface—			
Firebox	165 sq. ft.	165 sq. ft.	168 sq. ft.
Tubes	2,099 sq. ft.	2,191 sq. ft.	2,003 sq. ft.
Superheater	683 sq. ft.	761 sq. ft.	790 sq. ft.
Total	2,947 sq. ft.	3,117 sq. ft.	2,961 sq. ft.
Grate area	46 sq. ft.	50 sq. ft.	43 sq. ft.
Adhesion weight	51 tons	51 tons	53 tons
Total weight (engine) in working order.	91 tons	90 tons	88 tons

Traffic and Train Working on French Railways.

THE second query is as to the effects of the Ruhr occupation on French train services, in which connection Monsieur Vuillet replies that "The Ruhr occupation has had no effect on purely French traffic, except that coal and coke trains have been replaced by troop trains during some time on the Est. As regards international services the Paris-Riga Express is now limited to Essen, and the Orient Express now runs via Belfort and Basle to Vienna, instead of Strasburg-Munich. The timing of this train is slow in France and the distance from Paris to Vienna is covered in 33 hours (via Buchs-Insbrück—Salzbourg)."

Monsieur Vuillet also refers to some remarkable runs he has recently had on the Northern and Eastern lines. The Est run was made behind a 4-6-2 State type "Compound" superheater. (A large number of these engines have been supplied to all the French railways except the Midi and P.L.M.). The train was the Troyes-Paris, timed to cover the 103·3 miles to the regular stop just outside Paris station in 109 minutes. Load 500 tons, time 1 hr. 48 min. 40 sec. Speed, 70 miles an hour attained and maintained on the level, and 46 miles an hour average up 10 miles, averaging 1 in 185, with stretches at 1 in 160. Maximum speed 76 m.p.h. On the Nord—97 minutes Paris-St. Quentin—4-4-2 No. 2645. Pierrefitte Summit, average gradient 1 in 210. Load 295 tons. Speed 56 m.p.h. Creil was passed in 32 min. 25 sec. (31·3 miles). Return run, 390 tons. 4-6-0 No. 3543; 66 miles an hour on the level. Dead slow through Chantilly owing to signals, and a subsequent maximum speed of 50 m.p.h. attained on 1 in 200. Maximum speed 77 m.p.h. (Diameter of driving wheel 5 ft. 8½ in.) Monsieur Vuillet also mentions that the first engine of a new design of 4-6-2 locomotives has just been placed in service on the Northern Railway the initial engine, No. 3·1201, now undergoing trials.

Willoughby's Patent Steam Regulator Valve.

THIS appliance is designed more particularly for use with superheater locomotives. The location of the regulator valve between the superheater and the cylinders obviates the use of the usual dampers and rodding and causes the locomotive to respond more quickly to the throttle than when it is placed in the dome. The steam, when it leaves the boiler at 180 lb. per square inch working pressure, has a temperature of 380° Fahr., so that its

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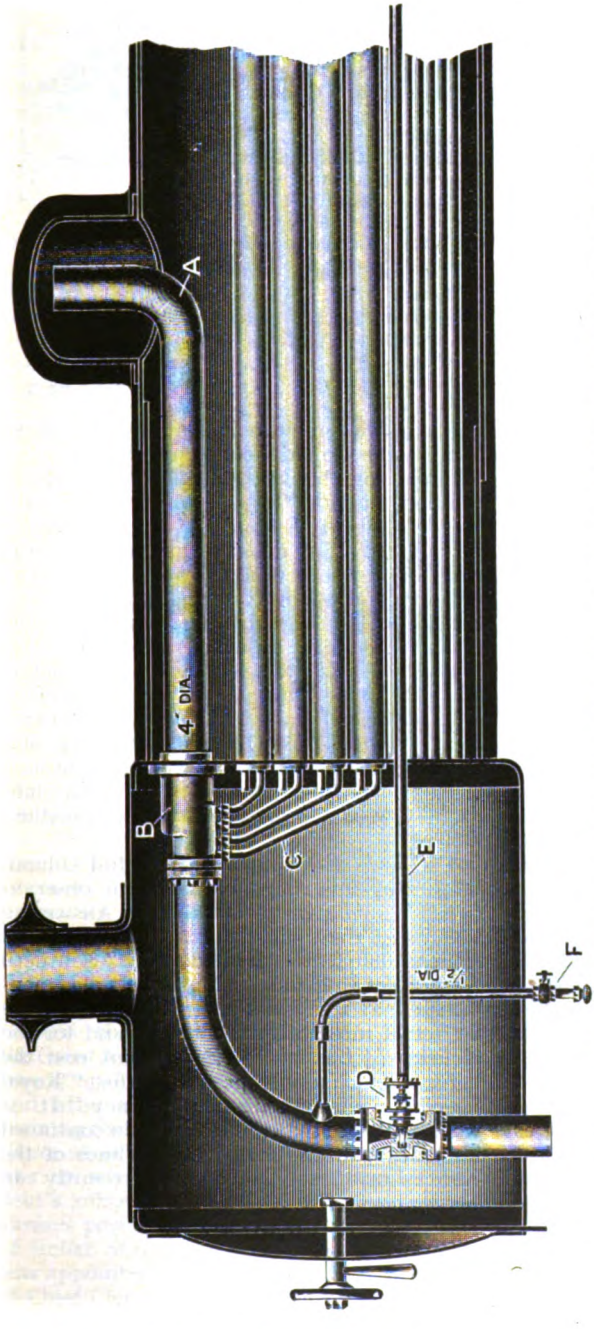
temperature is raised to the extent of 270° Fahr., owing to the fact that the superheater is in direct communication with the boiler,



APPLICATION OF THE WILLOUGHBY REGULATOR VALVE FOR SUPERHEATER LOCOMOTIVES.

irrespective of the regulating valve being open or closed, and subject to the pressure determined by the safety valves. A rise in pressure in proportion to the volume would, of course, occur if the steam were heated without being drawn from the superheater, which, however, would be relieved by the safety valve on the boiler. From observation it has been found that it takes from 5 to 8 minutes after a stop to obtain the average degree of superheat, and probably when this point is reached it is time for the driver to shut the regulator preparatory to stopping at the next station. This is due to the superheater elements cooling down after the regulator is shut, and a fairly considerable time is necessary to bring the temperature up again after the regulator is open. This method will greatly improve the efficiency of any type of superheater and reduce superheater troubles to a minimum. In the Willoughby valve, steam from the superheater header is conveyed by a main steam pipe to the regulator valve placed at a suitable position in or outside the smokebox, preferably fairly low down, so as to be as close to the cylinders as possible. It can be connected with the regulator handle either by a rod passing through the barrel of the boiler or externally. Further particulars can be had on application to John Willoughby & Sons, 34, Warwick Road, Batley.

French Railway Signalling.

In reply to correspondence in reference to his article under this title in the May number, Mr. C. H. Palmer writes: "Mr. Micklewood is quite right in his quotation from Monsieur Millaud's book. I have already been written to privately by another correspondent, so that I am glad to be able to make this explanation. The French, like ourselves, operate their signals, where mechanically worked, by single wires and use a counterweight to bring the signal automatically to danger should the wire break. I did not mean this in my remark, though the sentence certainly reads as if I did, entirely owing to a faulty correction. What I did refer to was the general principles of

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French signalling, which usually incline to the 'all right' rather than the 'danger' position being the normal one. I give a few examples :—

"(*a*) The Chassin electric staff system. Current locks the staves. Absence of current releases them. Should there be an electrical failure all the staves are free.

"(*b*) The 'crocodile.'—When the signal is at danger the electric current rings the bell; when the signal is off absence of current produces no sound. Should there be a failure even though the signal be at danger, the absence of current produces no sound.

"(*c*) The white light for clear.—Should a glass break the white light shows; so a clear signal would be given. I have often seen the spectacles in France in a cracked or half smashed state.

"(*d*) The normal position of block signals on double lines (except on the Paris-Lyons-Marseilles) is off.

"The usual principles of French signalling seem to be, as far as I have studied the question, that 'clear' is the normal position, though in the case quoted a breakage will bring the signal to danger. I must ask the indulgence of readers for not making myself clear in the first place and hope that all misunderstandings are now cleared up."

Royal Journeys in Switzerland.

HERR E. HILDBRAND, of St. Gall, Switzerland, sends us the following particulars of the Royal train of H.M. King George when returning from inspecting the war graves in Italy. This train ran through Switzerland, and in order to secure smooth working the various railway administrations received four weeks' notice of the journey. The run was made during the night of May 13–14, and eclipsed the previous record established by the Royal train of the King of the Belgians, of which particulars were published in the RAILWAY MAGAZINE in August, 1922.

The "heating carriage" was attached for the added comfort of those in the Royal train, which was hauled by two locomotives throughout. This train is one of the heaviest passenger trains run over the electrified lines of the Swiss Federal Railways.

The Royal train had the following cars in its marshalling :—

	tons.
1 Heizwagen (or heating carriage) 4 wheels	25
2 Luggage vans of the International Sleeping Car Company, each 6 wheels	44
2 Sleeping cars of the International Sleeping Car Company, each 8 wheels..	87
1 Saloon car (H.M. King George's private car), 8 wheels	41
3 Saloon cars of the International Sleeping Car Company, each 8 wheels ..	155
1 Saloon Car of the P.L.M., 8 wheels ..	44
10 Cars Total weight empty ..	396

The times were :—

			miles.
Chiasso	dep.	23.20	139·8
Lucerne	arr.	3.5	
Lucerne	dep.	3.30	34·5
Olten..	arr.	4.22	
Olten..	dep.	4.23	24·3
Bale	arr.	5.0	

The trip was made non-stop between these points—the stop at Lucerne of 25 min. being required for change from electric to steam traction and for "brake tests." The "all-over" time of 5 hours 40 min. compares very favourably indeed with the pre-war time of 7 hours 6 min., also the present schedule of 6 hours 22 min.

Unlike the Belgian Royal train (in view of the prevailing unsettled conditions) this "special" was preceded by a light engine. The staff at the stations were not advised that it was a Royal train, but only as an "extra train." The Chief Officers of the 5th and 3rd divisions accompanied the train through their respective territories, but being a night journey were not presented to the travelling monarch.

The Swiss newspapers had a full column concerning this train and made the observation "Who pays for this train?" Answering the query they stated that the cost, Swiss francs 6,000, will be debited to the "Southern Railway of England." The article also mentioned that the Swiss Federal Railways—as an act of international courtesy and for the security of the train—ran without cost the light engine which preceded the "Royal Special" throughout its journey. It is worthy of note that the Royal train continued its journey from Bale over the lines of the Alsace-Lorraine Railway, so recently an enemy possession.

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MR. T. W. WATTS, who has retired from the position of Commercial Superintendent of the Great Eastern Railway, which position he had held since 1915, entered the service at the age of 15 years. After general training at country stations he became Cashier at Ipswich Goods and then Chief Clerk at Colchester. Thence he transferred to the Goods Manager's General Office, Liverpool Street, London, until appointed Chief Clerk to the Ipswich District Goods Manager. Subsequently he was given charge of the Stratford Fruit and Vegetable Market and Goods Depôt, until promoted to be District Goods Manager at Ipswich.

* * *

MR. R. H. TODD, who has been appointed Cartage Manager, Southern Area, London and North Eastern Railway, was previously London Cartage Manager for the Great Northern, Great Central and Great Eastern Railways. Mr. Todd entered the service of the Great Northern Railway at Spalding in 1885, and after a few years' training there and experience at other stations, was transferred to the District Superintendent's office at Boston. After occupying various positions in that office, including that of Relief Stationmaster for a short time, he was appointed, in June, 1896, to the position of Chief Clerk to the District Superintendent at Boston. In 1902 Mr. Todd was appointed Chief Clerk to the District Goods Manager, and in 1903, Goods Agent at Boston and Boston Dock. In 1910 he was transferred to Nottingham as Goods Agent, and in 1916 was promoted to the charge of King's Cross Goods Station. His appointment as London Cartage Manager for the three railways mentioned above dated from July 1, 1919.

* * *

WE regret to record the death, on June 4, of Mr. Sam Bircham, J.P., formerly Solicitor to the London and South Western Railway. Mr. Bircham was educated at Eton and Oxford, and was admitted a solicitor in 1864. From the outset Mr. Sam Bircham began railway practice under his father, the late Mr. Francis Thomas Bircham, who was solicitor to the company from its initiation. Mr. Sam Bircham was appointed Solicitor to the company in 1890, but his firm acted as its solicitors from the retirement of Mr. F. T. Bircham in 1883 up to 1890, Mr. Sam Bircham representing the firm during that period. Mr. Sam Bircham retired from the position of Solicitor to the company on June 30, 1910.

MR. E. W. BEATTY, K.C.,
President of the Canadian Pacific Railway, who is on a business visit to Europe.

* * *

MR. A. MCISAAC, who has been appointed District Stores Superintendent, Southern Scottish Area, London and North Eastern Railway, entered the service of the North British Railway as a junior clerk in 1898, in the Stores Department. After passing through the various sections of the department and obtaining experience in the distribution and purchase of stores and the accounting work connected therewith, he was appointed Chief Clerk to the Stores Superintendent in 1913, retaining that position until his recent appointment.

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WE regret to announce the death of Mr. H. W. Witt, the recently-appointed registrar of the Southern Railway, who passed away on June 9, after a brief illness, aged 59 years. Mr. Witt entered the service of the London, Brighton & South Coast Railway as a junior clerk in 1878, and for many years was the registrar. In January last he was appointed the registrar of the Southern Railway.

* * *

WE are officially informed that the following appointments, to date from July 1, have been made by the Board in connection with the scheme of re-organisation of the Southern Railway :—

Mr. Godfrey Knight to be Secretary.

Mr. William Bishop to be Solicitor.

Mr. E. C. Cox to be Chief Operating Superintendent.

Mr. A. D. Jones to be Locomotive Running Superintendent.

Mr. C. A. de Pury to be Chief Accountant.

Mr. H. A. Sire to be Chief Commercial Manager.

Mr. F. H. Willis to be Indoor Commercial Manager.

Mr. G. T. Hedge to be Outdoor Commercial Manager.

Mr. A. W. Szlumper to be Chief Engineer.

Mr. G. Ellson to be Deputy Chief Engineer.

Mr. R. E. L. Maunsell to be Chief Mechanical Engineer for Locomotives, Carriages, Wagons, and Road Vehicles.

Mr. S. Warner to be Assistant Mechanical Engineer for Carriages, Wagons, and Road Vehicles.

Mr. A. H. Panter to be Deputy Assistant for Carriages and Wagons.

Mr. G. S. Szlumper to be Docks and Marine Manager.

Mr. Herbert Jones to be Electrical Engineer.

Mr. H. Richards to be Assistant Electrical Engineer.

Mr. C. Francis to be Stores Superintendent.

Mr. A. P. Innocent to be Assistant Stores Superintendent.

Mr. E. T. Stanley to be Horse Superintendent.

Mr. R. Duckworth to be Chief of Police.

Mr. W. J. Clayton to be Estate Agent for the S.E. & C. Section.

Mr. W. I. Selwyn to be Estate Agent for the L. & S.W. and L.B. & S.C. Sections and the lines in the Isle of Wight.

Mr. F. A. Pinfold to be Assistant to Mr. Selwyn.

Mr. S. E. Hitchcock to be Rating Agent for the S.E. & C. and L.B. & S.C. Sections, including Epsom and Leatherhead Line.

Mr. H. E. Judd to be Rating Agent for the L. & S.W. Section and the lines in the Isle of Wight

LISTENERS-IN on the London broadcasting circuit were favoured on Friday evening, June 8, with a wireless address by Mr. Cecil J. Allen, President of the Railway Club and regular contributor to the RAILWAY MAGAZINE of the monthly article "British Locomotive Practice and Performance." The subject of Mr. Allen's talk was "Train Speeds," a theme on which no one in Great Britain is more qualified to speak. Mr. Allen was heard to great advantage, his elocution and the attractive manner in which he dealt with his subject being equally meritorious.

* * *

IT is announced by the Ministry of Transport that in accordance with the provisions of Section 24 of the Railways Act, 1921, appointments have been made to the General and Railway Panels of the Railway Rates Tribunal for the period ending March 31, 1924. The Railway Panel, which comprises 11 persons nominated by the Minister of Transport after consultation with the Railway Companies' Association, will be as follows :—Mr. J. Ballantyne, London Midland and Scottish Railway; Mr. E. C. Cox, Southern Railway; Mr. O. C. Gatenby, London and North Eastern Railway; Mr. H. F. Loney, London Midland and Scottish Railway; Mr. E. Lowther, Great Western Railway; Mr. H. Marriott, London Midland and Scottish Railway; Mr. G. Marshall, London and North Eastern Railway; Mr. F. B. Mortimore, Great Western Railway; Mr. R. H. Nicholls, Great Western Railway; Mr. C. J. Selway, London and North Eastern Railway; Mr. H. Sire, Southern Railway. Lieut.-Colonel H. F. Stephens, Association of Railways, has also been nominated by the Minister of Transport to represent railways and light railways not parties to the Railway Companies' Association.

* * *

ADDRESSING a large gathering of railwaymen at Cardiff on the occasion of the presentation of medals and certificates to Great Western Railway ambulance men, Mr. Felix J. C. Pole, General Manager, said that since the appointment of Mr. G. H. Davey (Divisional Secretary) in January, no fewer than 500 beginners had joined the classes. It spoke volumes for what was being done to promote ambulance work in the district. Ambulance work on the Great Western had been on the up grade for some time. In the mysterious year 1913, which they always took as their datum line, there were 2,013 successes, while last year saw 4,896 successes. They had recently combined with ambulance work the "Safety Movement," of which the Great Western claimed to be the pioneers in this country.

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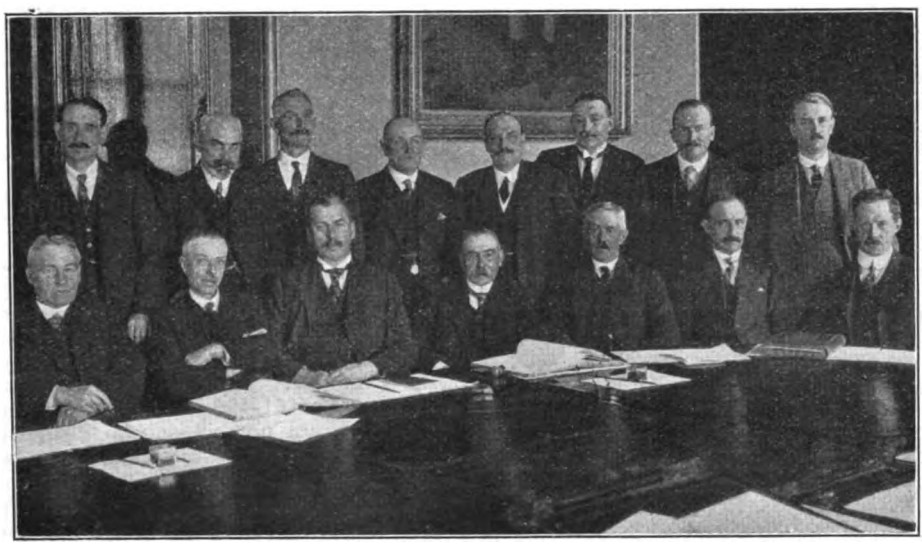
AT the annual meeting of the Great Northern Railway Sick and Funeral Allowance Fund held at Culross Hall, King's Cross, on Monday, May 28, the resignation of Mr. A. F. Dymant from the presidency of the fund was announced. Mr. Dymant has been associated with the fund in one capacity or other since 1904, and has rendered valuable services which have been highly appreciated both by the committee and the members. As a mark of esteem the members presented Mr. Dymant with a handsome timepiece and an illuminated album signed by representatives present at the meeting from all districts of the line. In acknowledging the gifts Mr. Dymant expressed his great regret at being compelled to sever his connection with the fund, and said that he would look back upon his past associations with feelings of profound pleasure. Mr. T. Smith, the Assistant Superintendent, Southern Area, London & North Eastern Railway, was unanimously elected President in succession to Mr. Dymant.

* * *

MR. FELIX J. C. POLE, General Manager of the Great Western Railway and President of the London Railways' Athletic Association has, by the unanimous desire of the General Committee and members, agreed to remain in office for another year.

* * *

AT the annual meeting of the North Eastern Railway Superannuation Fund, held at York, the Chairman, Mr. R. L. Wedgwood, announced that all the superannuation and pension funds in the Eastern Group were closed to persons newly appointed on or after January 1, 1923. This had been done on expert advice, and Sir A. Kaye Butterworth was preparing a report to the board on the question of the establishment of a uniform fund, an interim arrangement being contemplated under which the staff entering the service since the beginning of the year could pay contributions which would be placed to their credit in order that arrears might not accumulate pending the new fund's establishment.



GREAT NORTHERN RAILWAY SICK AND FUNERAL ALLOWANCE FUND.

COMMITTEE OF MANAGEMENT.

Front row, left to right:—Messrs. F. H. London, W. Rolfe, T. Smith, A. F. Dymant, J. Wardle, A. Coulson and S. Smith.

Back row, left to right:—Messrs. A. O'Leary, J. R. Blackburn, H. Sims, W. Rimes, G. F. V. Cutting, H. Nichols, E. H. Crosby, and J. W. Seymour.

* * *

DERBY DAY imposes a very great strain upon the railways serving Epsom, calling for train provision on a large scale, the working of which entails a great deal of close and careful organisation, both before the event and in carrying out. As the three lines primarily concerned are now combined

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in the Southern Railway, traffic working on June 6, was distributed between the three sections, the South Eastern and Chatham line taking London and Croydon traffic to Tattenham Corner, dealt with mainly at Charing Cross and London Bridge, Brighton section traffic concentrated chiefly at Epsom Downs, and the South Western section at Epsom Town. On the railway side the number of passengers conveyed reached, if they did not exceed, all previous records, but working fully justified the careful schedules and operating arrangements prepared. On the South Eastern and Chatham section 54 down special trains were scheduled, one extra having to be run due to the need for duplicating one of the excursions, while three additional up trains were run. At no period was there any serious accumulation of passengers, up trains leaving at four or five minute intervals, and each time any suggestion of congestion occurred it was relieved in about 10 minutes. Altogether some 38,000 passengers were conveyed by this route. On the Brighton section there were 42 specials, while Waterloo sent 18 trains in addition to the ordinary services. Three reserved Pullman Car specials were run, two by the South Eastern and Chatham route, and one on the Brighton section.

* * *

In connection with the Permanent International Association of Road Congresses, held at Seville, Mr. Frank Pick, one of the Assistant Managing Directors of the London General Omnibus Company and the associated "Underground" Companies, read an interesting paper on "The Development of Motor Transport." Tracing the early influence of railways upon British road traffic and the re-development in recent years of road transport following upon the introduction of motor vehicles, Mr. Pick brought out a number of points emphasising the essential factors in the road transport problem of to-day.

* * *

A Hove reader remarks that several London, Brighton and South Coast goods locomotives of the 0-6-0 type have appeared painted brown instead of black; also that 4-4-0 engine No. 315 has had its name, *J. Gay*, removed, and that a number of engines of various types have been rebuilt. Among the 4-4-0 locomotives rebuilt in the same style as No. 55, Nos. 45 and 60 have been similarly dealt with. The same correspondent refers to the fact that on Whit Monday special trains were run from Gillingham and Reading, South Eastern and Chatham section, to Brighton, the former transferring to the "Brighton" section at Tunbridge Wells and the other at Guildford. South Eastern and Chatham locomotives worked through, and it is suggested that this may herald the introduction of regular services in due course.

* * *

Mr. R. S. John, a Surbiton reader, mentions that, while in the Isle of Wight, he noticed two London and South Western 0-4-4 tank engines, Nos. 206 and 211, working trains between Ryde and Ventnor. Apparently, they are replacing Isle of Wight locomotives, for which purpose they are fitted with the Westinghouse brake. Mr. John, together with other readers, remarks that London and South Western 4-6-0 locomotives, both of the 443 and 736 classes, are working regularly on passenger trains between Waterloo and Portsmouth Harbour.

* * *

Mr. A. G. Dunbar, of Glasgow, mentions that one of a series of 0-4-4 tank engines built last year for the Caledonian Railway is numbered 1000, in view of it being the 1,000th locomotive built at St. Rollox works. He also points out that the old 2-4-0 engines of the No. 35 class had 7 ft. 2 in. coupled wheels, and not 7 ft. 7 in. as previously stated. Nos. 191–198 of the new "Oban" 4-6-0 class are now in service. Highland engines of the "Clan" 4-6-0 class have been fitted with the Westinghouse brake and now work through between Glasgow and Inverness on alternate days. Mr. Dunbar also gives particulars of various older Caledonian locomotives recently scrapped.

* * *

Mr. W. E. Boyd, of Edinburgh, writes that North British 4-4-0 engine No. 287, *Glen Gyle*, has received a new boiler carrying three safety valve columns as in the case of the "Atlantics." Some of the non-superheated 0-6-0 locomotives of Class "B" have now been rebuilt at Cowlairs, and fitted with superheater boilers. These engines retain their slide valves. Several North British locomotives have been tested on the Great North of Scotland section. Mr. Boyd asks for information concerning North British 0-4-0 tender engine No. 1011. When last seen by him (in September, 1922), it was working the Moffat Mills branch in the Airdrie district.

* * *

Several readers have pointed out that Great Central locomotive No. 363, illustrated on page 462, June Railway Magazine, is a two-cylinder "simple" engine, and not a three-cylinder "compound," as in the case of Nos. 364 and 365. A Leicester reader

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remarks that driver H. Bailey, recently mentioned in Mr. Allen's articles, although he has retired from the footplate, has held the position of locomotive inspector for several years.

* * *

SINCE May 1, the 4.20 p.m. slow train from London Bridge (London, Brighton and South Coast) to Tunbridge Wells via Oxted and Edenbridge Town, has started from Cannon Street (South Eastern and Chatham section) at 4.16 p.m., leaving London Bridge (High Level South Eastern and Chatham) at 4.20, working thence over the London, Brighton and South Coast route to Tunbridge Wells. South Eastern and Chatham section locomotives and coaches are employed. At Whitsun an excursion was run from Dartford, Woolwich, &c., to Brighton, working into the South Eastern and Chatham Low Level station at London Bridge, reversing there and continuing thence over the London, Brighton and South Coast section. The Easter excursion from Chatham, &c., to Brighton, was repeated at Whitsun. This train reversed at Strood, and ran via Maidstone West and Paddock Wood to Tonbridge, where it again reversed ; it passed on to the London, Brighton and South Coast section at Tunbridge Wells.

* * *

EXPERIMENTS are being made on the Southern Railway with coaches painted in various colours, with a view to arriving at a decision for a distinctive livery for Southern Railway coaching stock. A South Eastern and Chatham 10-compartment bogie third-class carriage has been painted dark blue, about the shade of the Somerset and Dorset Joint Railway coaches, picked out with white lines around the quarter lights, whilst a London, Brighton and South Coast brake van and another vehicle are running painted old Brighton red-brown. The new antimacassars in the South Eastern and Chatham section trains have " S.R. " woven in them instead of " S.E. & C.R."

* * *

REFERRING to Mr. G. D. Millar's article on the Cricklewood–Acton branch of the late Midland Railway, in the June number, Mr. J. Wrottesley points out that there were a few passenger trains run over this line in the summer of 1906, while in that year through carriages between Portsmouth and Southampton and Bradford and Nottingham were worked that way. He recalls that for a short period local trains working over this line ran through to Earl's Court.

* * *

MOST RAILWAY MAGAZINE readers are aware that the activities of Bassett-Lowke, Ltd., of Northampton, London and Edinburgh are not confined to railway and locomotive models. We understand from the firm that there is great activity in their Model Shipyard at Northampton. As probably our readers are aware, very few model ships were made during the war and since the war a number of ships have been re-conditioned and new tonnage put into commission and naturally the shipping companies are anxious to have models of their new ships for their offices, agencies, &c., in the British Isles and different parts of the world. Among recent contracts, Bassett-Lowke, Ltd., have secured, have been models of the :—

SS. *Massilia* and ss. *Asie* for the Chargeurs Reunis, of Paris.

Models of the Swedish Lloyd boats :—

Patricia, *Bernicia* and *Saga*, for the Gothenburg Exhibition.

Models of the Red Star liner *Belgenland*, one of which is on exhibit at the company's offices in Cockspur Street.

SS. *Ceramic*, for the White Star line, &c., &c.

The method of using sectional and other models of machinery, &c., at exhibitions in preference to the actual articles should also tend to greater activity in the model making world, especially in view of the enormous number of exhibitors at the British Empire Exhibition at Wembley in 1924.

* * *

OWING to the growing favour of Worthing as a holiday resort, proposals have been made for the introduction of through carriages between the Midlands and Worthing. At present the " Sunny South Special " gives connections only via Brighton.

* * *

AT a recent board meeting in Paris of the International Sleeping Car Company, an agreement was reached between that company and the Pullman Car Company of England for the introduction of Pullman cars on day services on the Continent. The cars will form part of the Wagons-Lits Company's undertaking under a joint partnership with the Pullman Company, and it has been arranged that the first service to be introduced will be between Calais and Paris. It is probable that the existing Pullman services between London and Dover will find their continuation on the French side before the end of the year, and that in due course Pullman cars will run between Paris and Brussels and on several other international routes.

* * *

IN the renaming of stations on different routes of the new Southern Railway which have identical names, the directors propose, in order to avoid clashing with the name of

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the former Brighton Company's Boxhill station, to alter the name of the former South Eastern and Chatham station at Dorking to "Deepdene."

* * *

On May 22, 1923, the Great Western Railway established two additional express passenger train services from Paddington to Bristol by slipping a portion of the train at Stoke Gifford off the 8.45 a.m. and 8 p.m. from Paddington to South Wales expresses via the Badminton line and Severn Tunnel, an engine being in readiness at Stoke Gifford to take forward the Bristol portion as soon as it has been slipped from the South Wales train. This enables Bristol passengers to leave Paddington at 8.45 a.m. and reach Bristol, T.M. at 11.3 a.m. and in the evening the 8 p.m. departure from Paddington will give them an arrival at Bristol at 10.20 p.m. a call being made at Stapleton Road so that the Clifton and Avonmouth line passengers can transfer into the 10.21 Clifton Branch train at that station. These services which it is hoped will become permanent will no doubt be much appreciated by Bristol and Clifton passengers from London.

* * *

At the Railway Club, 65, Belgrave Road, S.W. 1, on May 11, Mr. E. Wallis read a paper on "Systems of Signalling on the London, Brighton and South Coast Railway," illustrated by an admirable series of lantern slides. The lecturer showed some working models of locking and special signalling arrangements, which received considerable attention from the members present, who, at the close of the proceedings signified their cordial appreciation of Mr. Wallis' paper, and their thanks to the London, Brighton and South Coast section of the Southern Railway for the loan of their slides.

* * *

It is reported from Dublin that a provisional agreement for the amalgamation of the Great Southern and Western and the Midland Great Western Railways has been approved by the boards of both companies and signed. The negotiations in progress some months ago for an amalgamation between the Great Northern and the Midland Great Western came to nothing. Subsequently the project of the union of the Western and Southern lines was revived, and after a long negotiation common ground was reached, and the companies will now be able to go before the Government with a plan which will, if approved and carried out, undoubtedly benefit the area served by these two important Irish sytems, extending from Sligo in the north to Baltimore in the south, and from Dublin to the most remote points in Galway and Kerry. Grouping of the Midland Great Western and Great Southern and Western lines will, it is stated, probably be followed by the inclusion of the Dublin and South Eastern, which would give an alternative route to the south by the east coast.

* * *

New head codes have been introduced on the South Eastern and Chatham Section of the Southern Railway. As from Sunday, April 8, white discs and lights only have been employed as head codes for route-indicating purposes, displacing the white disc with black cross and green lights included in the head codes introduced in February, 1917. Six positions are now available, three on the buffer beam, one at the foot of the chimney, and one on either side of the smokebox or bunker. Using one or two discs or lights variously placed and combined, 21 codes are thus available with different applications on respective sections, but not conflicting. Ordinary specials are not now indicated, but three white lamps or discs are used for Royal specials and for the breakdown train.

* * *

New posters issued by the London Underground Electric Railways include one referring to the Zoo by J. Martin Pollock, and another advertising Southend-on-Sea by Charles Pears. The latter is a striking view of the Chapman Light.

* * *

The Westinghouse Brake and Saxby Signal Co., Ltd., of London and Chippenham, have received orders for Westinghouse brake equipments for 150 new coaches for the London Electric Railways."

* * *

Though only six in number the papers read at the Institute of Transport Congress, held at Sheffield, June 14-16, covered a wide range. That by Mr. J. A. Jenkinson, on "The Railway Requirements of a Large Industrial Area," was peculiarly suitable for consideration at a place like Sheffield; while Sir Robert Hadfield's contribution on "Modern Trackwork and its Importance" emphasised the close association between one of the great Sheffield industries and railway engineering. "Cargo Handling at Ports: British and American Practice Compared," by Mr. Brysson Cunningham, invited attention to one of the most important aspects of transport economics (rail, road and water), while Major-General Sir W. Sefton Brancker on "Air Transport," Mr. A. Dryland on "British and American Methods in Road Construction and Maintenance," and Mr. E. S. Rayner on "Tramways from a Traffic Point of View under Existing Conditions," introduced other branches of the great transport industry. In the August Railway Magazine fuller details will be given.

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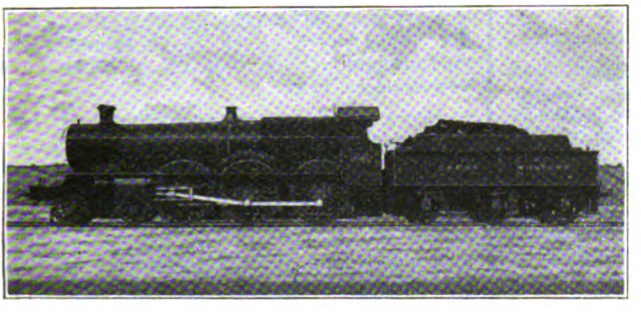
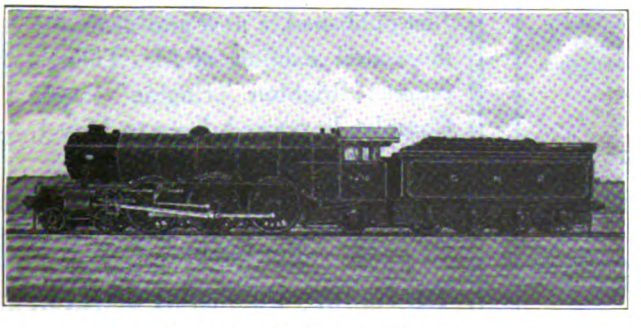


Great Western Railway.
Four-cylinder 4-6-0 locomotive No. 4061, *Glastonbury Abbey.*

London Midland and Scottish Railway.
London and North Western four-cylinder 4-6-0 locomotive No. 1407, *L/Corp. J. A. Christie, V.C.*



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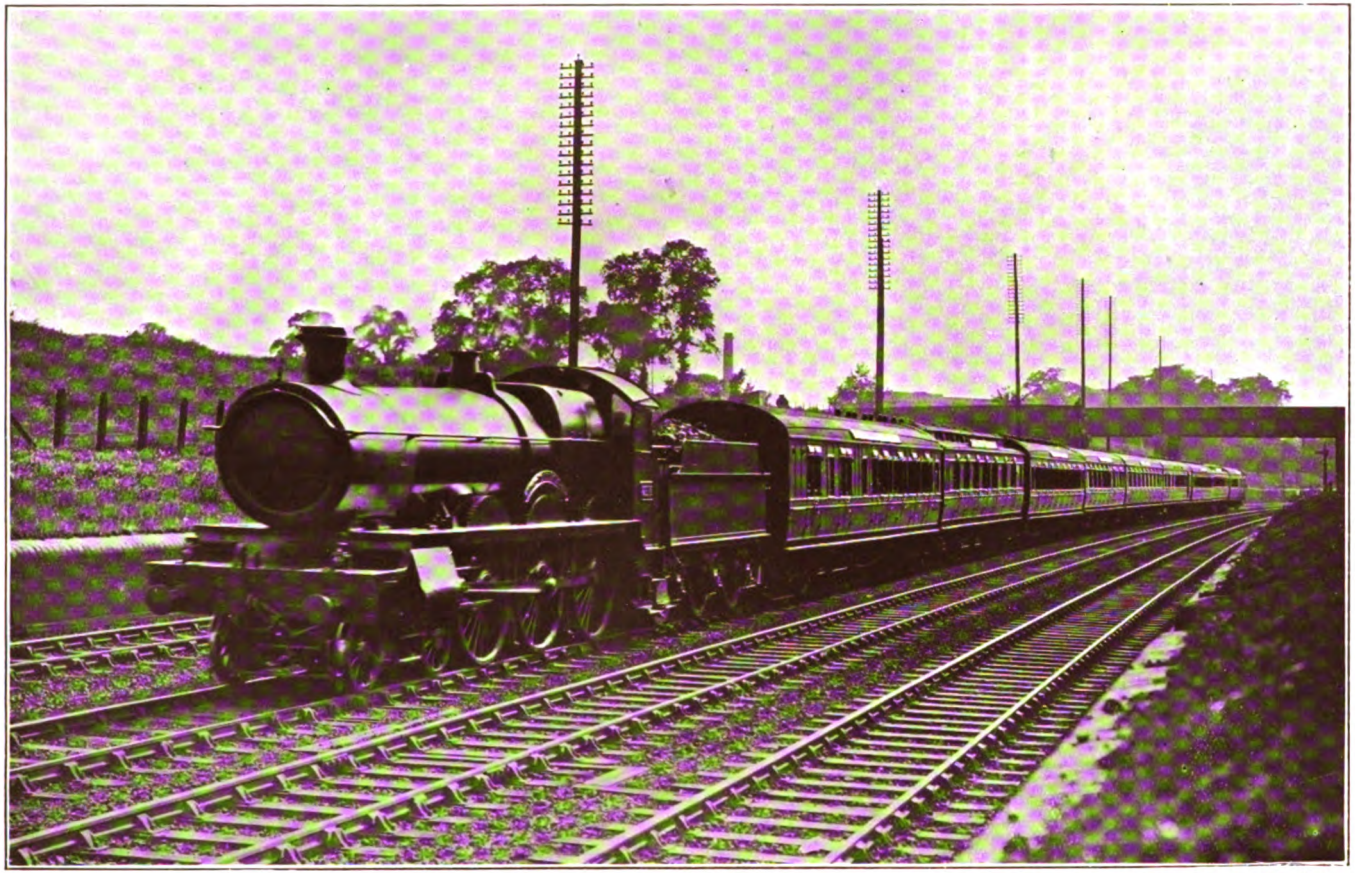

THE RAILWAY MAGAZINE.] [*Photographed near Acton by F. E. Mackay.*

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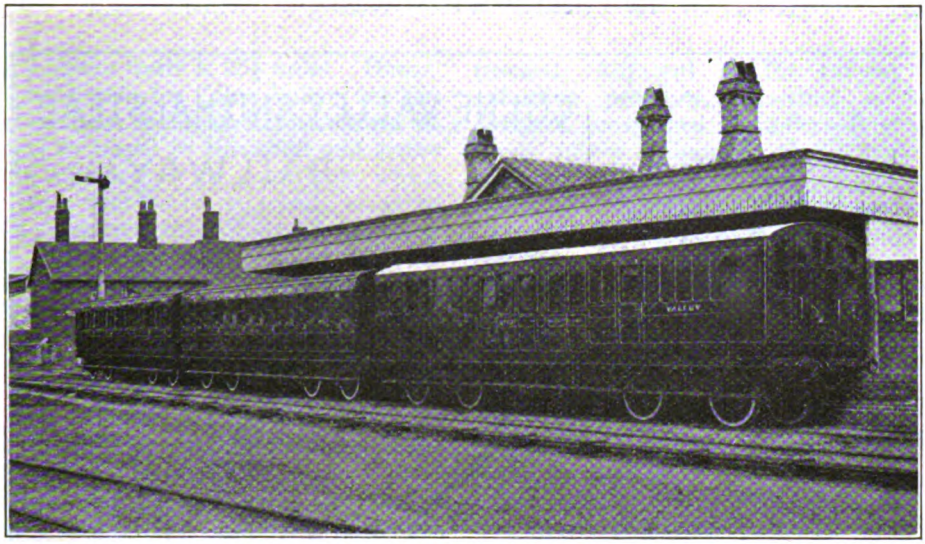

Photo.] THREE-COACH BOGIE SET USED FOR PRINCIPAL TRAINS. [*J. E. Tyler.*

Converted from Metropolitan District Railway electric train used for original experimental trials.

The Colne Valley and Halstead Railway.

By J. F. GAIRNS.

INCORPORATED in 1856, and constructed under the Colne Valley & Halstead Railway Act of that year, this railway, though little known outside the district served, plays an important part in the transport system of North Essex contiguous to the Suffolk boundary, and, as will be seen, provides, though on a small scale, a considerable amount of material of interest. The Colne Valley Railway, to use the abbreviated form generally employed, has already been described in these pages, a comprehensive article having been published in the November, 1901, number of the RAILWAY MAGAZINE. During later years many developments and improvements have been made, while the changes produced by time call for special consideration. For that reason, and in view of the fact that, except for the completion of amalgamation procedure, the Colne Valley & Halstead Railway Company has already been absorbed as a "subsidiary" component of the London & North Eastern Railway Company, though at the time of writing it is still being operated on a more or less independent basis, a valedictory description of the railway will, no doubt, be appreciated by our readers.

As originally promoted, the line was to run from the Marks Tey and Sudbury line of the Great Eastern Railway at Chappel to Halstead, a fairly important country town, and, to some extent, a market centre, as well as accommodating several industrial undertakings. The first sod was cut at Elms Hall on February 16, 1858, but it was not until April 16, 1860, that the Chappel-Halstead section was opened for traffic. Before this occurred, however, the extension from Halstead to Haverhill had been authorised on August 13, 1859, work thereon being commenced in 1860, and the remaining sections of the line opened as follows: Halstead to Hedingham, 3½ miles, July, 1, 1861; Hedingham to Yeldham, 2¾ miles, May 26, 1862; and Yeldham to Haverhill, 7 miles, May 10, 1863. The line was worked under contract by Sir Daniel Gooch, a former locomotive superintendent of the Great Western Railway, from January 1, 1865 until December 31, 1866, for 35 per cent. of the gross receipts. From January 1, 1867, until June 15, 1867, it was worked under

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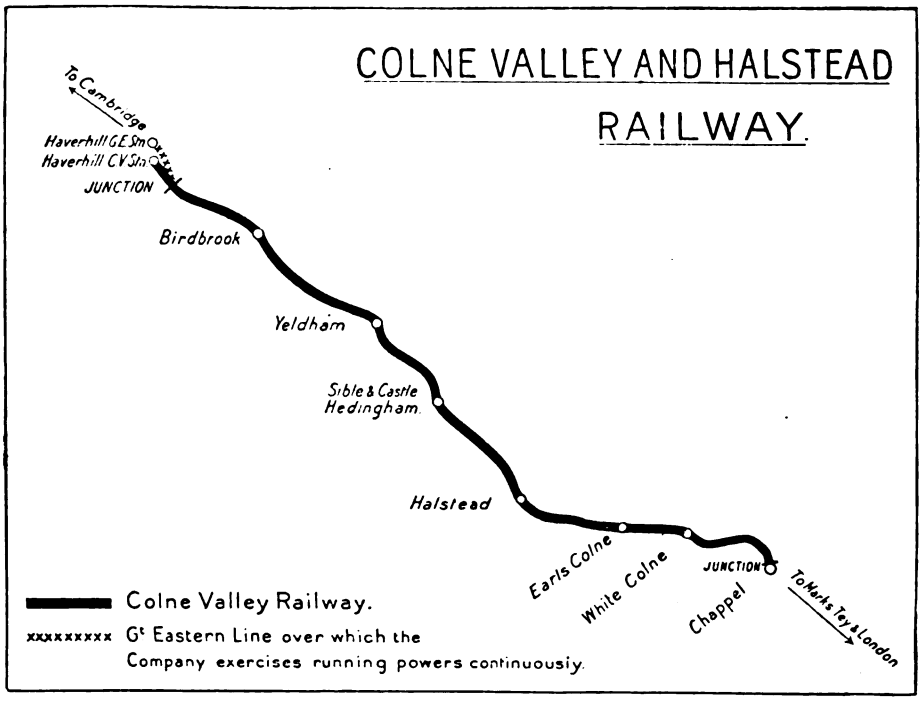

contract by Mr. C. B. Sperling, the company taking the net receipts beyond working expenses. Mr. R. J. Watts, the traffic superintendent then became the contractor for a short time. Originally, the line terminated at what is now the Colne Valley goods station in Haverhill, but on June 1, 1865, the Great Eastern Railway opened the branch line from Shelford, on the Cambridge main line, to Haverhill, terminating at a station about half-a-mile away from the Colne Valley station. Pending the completion of the Great Eastern line connecting Haverhill and Sudbury, opened in August, 1865, the Great Eastern Railway ran a goods train over the Colne Valley line, for traffic between the Cambridge and Colchester sections, using the connecting line, about 1 mile in length, from near the Great Eastern station at Haverhill to join the Colne Valley line at what is known as Colne Valley Junction, about three-quarters of a mile from the Colne Valley station at Haverhill. This line was provided for in the Great Eastern Company's Act. In order to provide for transfers of passengers between the two systems it has been the practice ever since for Colne Valley passenger trains to work to and from the Great Eastern station, the Colne Valley station being reserved for goods traffic, though there is a passenger platform there at which the last passenger train sets down its passengers, as it is too late for any connection on the Great Eastern line. Colne Valley goods trains also run to the Great Eastern line for handing over or receiving goods traffic.

At Chappel, or, to use its correct name, Chappel and Wakes Colne, Colne Valley trains use the Great Eastern station. In fact, on most services the Colne Valley vehicles run to and from Marks Tey, being detached from west-bound Great Eastern trains at Chappel, or attached to trains for Marks Tey in the opposite direction. Colne Valley locomotives, however, do not usually work beyond Chappel station. Immediately after leaving Chappel station the Colne Valley line curves away to the west, the Great Eastern line proceeding substantially north for some distance, as it has a relatively circuitous and lengthy journey to make before it turns westward to make connection again with Colne Valley trains at Haverhill. In fact, while the distance between Chappel and Haverhill by the Colne Valley route is 19 miles, the distance between the two stations by the

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Great Eastern route is 25¼ miles. Hence, it is practicable for Colne Valley vehicles detached from a Great Eastern train at Chappel to travel to Haverhill and arrive well in advance of the train from which they were previously detached, so as to enable passengers from Halstead and other Colne Valley stations to connect with the same Great Eastern train for continuation in the Cambridge direction. Similarly, in the case of up trains : a connecting Colne Valley train leaving Haverhill after the Marks Tey train has left is able to arrive at Chappel before the train to which its vehicles are to be attached for the remaining three miles to Marks Tey.

For most of its length the Colne Valley Railway keeps close company with the River Colne, seven of the fairly numerous bridges on the line (none calls for special remark) being required to cross the winding waters of the river. Between Chappel and White Colne, a distance of 2 miles, some fairly severe gradients are encountered, trains from Chappel having to surmount ¼ mile at 1 in 70 and another at 1 in 60, while up trains have to face about ½ mile at 1 in 60, together with ¾ mile at 1 in 70–80. The next station is known as Earls Colne, this including neat and somewhat attractive premises, though here, as at all stations, whether single-line crossing places or not, there is only one platform. Two and a half miles further on and the market town of Halstead is reached. Adjacent to the railway are extensive premises, including a well-designed goods shed of modern type with goods offices adjoining, the company's engine shed, carriage and wagon and locomotive repair shops, a pumping station (the company having its own water supply), the general offices and stores, a granary, and stables for the three horses employed for local cartage and for horse shunting, though most of the shunting is now done by engine. There are also fairly extensive sidings, so that a passenger footbridge, which spans the railway area a short distance east of the station, is quite a lengthy erection.

Until recent years, White Colne station was known simply as Colne, this being one of the original stations, though it was closed in the 'eighties, and it was not until 1907 that it was reopened for goods traffic, its present name applying since it was again brought into use for passenger traffic in 1908. Earls Colne was opened in 1882 under the name of Ford Gate, taking the name of Colne when the original Colne station was closed. Ford Gate received its present name in 1905 to avoid confusion with Calne in Wiltshire and Colne in Lancashire. The name of the original Castle Hedingham station, after being abbreviated to Hedingham alone, has for a number of years past been expanded to combine the names of the villages of Sible and Castle Hedingham.

EARLS COLNE STATION.

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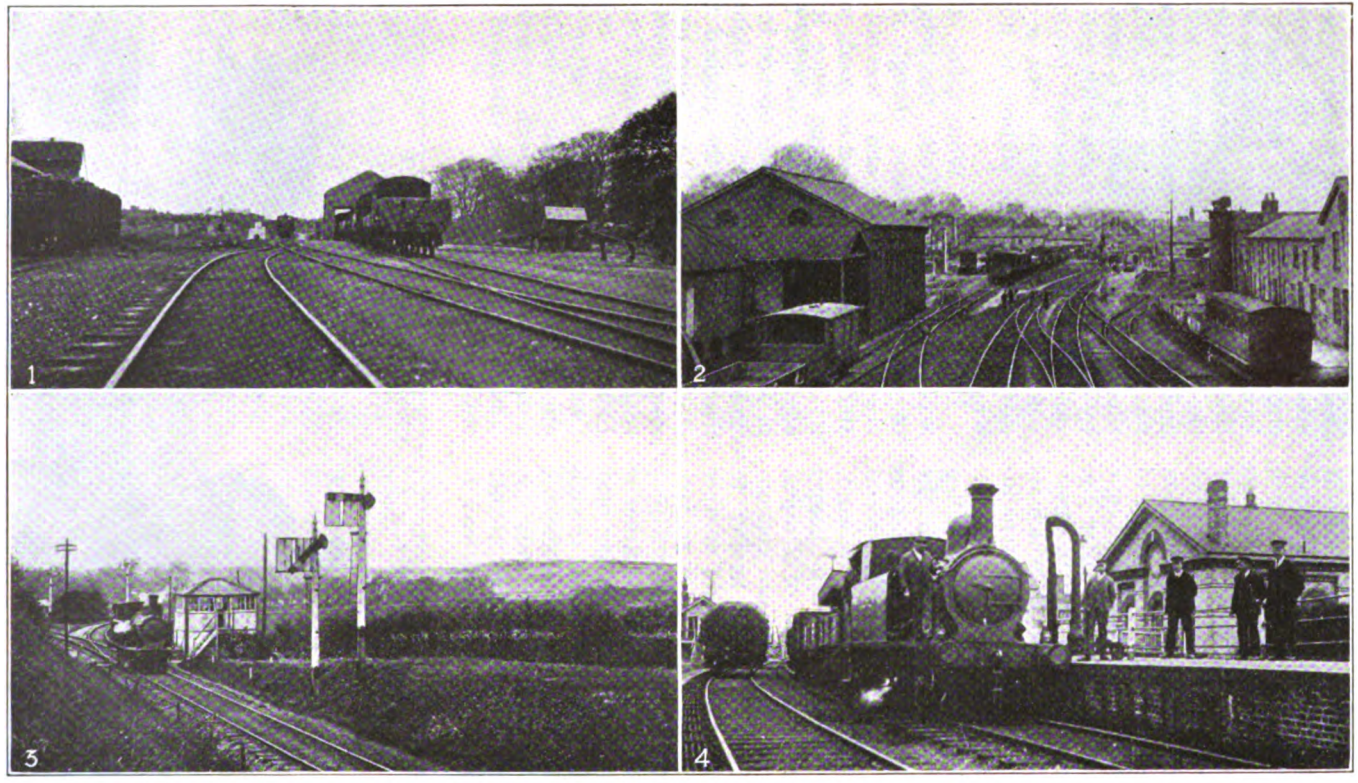

Photos.] [*J. F. Gairns.*

1.—HAVERHILL (COLNE VALLEY) STATION AND YARD.

2.—GENERAL VIEW OF HALSTEAD STATION AND YARD.

3.—COLNE VALLEY JUNCTION, HAVERHILL.
Branch to Great Eastern Station to right.

4.—GOODS TRAIN IN HALSTEAD STATION.
2-4-2 tank engine, No. 2.

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Although the heaviest gradients are at the Chappel end of the line, and therefore have to be faced by trains which are most heavily loaded, the major part of the traffic, both goods and passenger, being between Hedingham and Halstead and Chappel, there are some steep sections elsewhere, notably a gradient of 1 mile at 1 in 70–80 between Birdbrook and Haverhill. Traffic is controlled by electric train staff between Chappel and Earls Colne, remaining sections being worked by train staff and ticket, in some instances with Annett's key attached. The crossing stations, though, as already mentioned, none has a second platform, and only very occasionally are passenger trains crossed, are Earls Colne, Halstead, Sible and Castle Hedingham, Yeldham, and Colne Valley Junction, Haverhill. From this junction there are, of course, sections to the Colne Valley station at Haverhill and to Haverhill, Great Eastern station. Signalling is entirely in accordance with modern principles, stations having the usual equipment of signals, while some of the distants are fitted with Coligny-Welch illuminated fishtail lamps. All level crossings are protected by signals interlocked with the gates. The signal cabins compare with those of main line railways, being fully interlocked, while the station premises as a whole, though necessarily not calling for extensive passenger accommodation, are quite creditable for so small a line. At Halstead the station buildings accord with the importance of the town, while, as already indicated, the goods depôt, general offices and other premises suggest a railway of considerable importance.

Until comparatively recently, Colne Valley Junction at Haverhill provided an example of old-style signalling, in that four arms, two for each direction according to route, were carried on posts above the signal cabin, two double-faced lamps serving the four arms. The cabin is the property of the London & North Eastern Railway, though it is manned, for mutual convenience, by Colne Valley staff. The old signals were replaced on modern lines in 1911.

A considerable proportion of the line is now laid with bull head rails and chairs, though there is an extension mileage still remaining of flat-footed rails, mainly on the western section where traffic is relatively light.

As many as six or seven passenger trains each way daily have been run in the past, but it is found that general public requirements can be fully met by three trains each way daily throughout the line, together with one between Chappel and Hedingham and another from Hedingham to Chappel, which, on Mondays, starts from Haverhill, all services making good connections with Great Eastern trains, usually at both ends of the line. For the 8.3 a.m. from Hedingham to Chappel (7.38 a.m. from Haverhill on Mondays), and the 9.26 a.m. from Chappel to Hedingham, a set of older six-wheeled vehicles is used, but all the other passenger services utilise two well-equipped bogie carriages, strengthened as needed by six-wheeled stock. A somewhat interesting history attaches to the two bogie vehicles mentioned, together with a bogie van belonging to them, though for some time past it has been laid on one side owing to the need for heavy repairs due to damage resulting from a fire at premises near which the vehicle was standing. These three vehicles constituted, in fact, the train constructed by the Metropolitan District Railway, before the days of electrification, for experimental purposes. After they had served their purpose they were bought by the Colne Valley Company, the electrical gear removed, the interior refitted, and electric lighting on the Stone system installed. As now running, they constitute very creditable vehicles which ride well and present a quite satisfactory appearance, both inside and outside.

Two passenger trains are now run each way on Sundays, though usually there are no Sunday trains, except during the summer months. These services came into operation on June 3 this year. The country traversed is chiefly agricultural, but it possesses many attractions for the tourist. In several places the surroundings of the line are quite picturesque, while the district possesses a number of places of tourist and historic interest. Cuttings of moderate depth and embankments frequently occur.

Goods traffic is mainly worked by two goods trains, morning and evening, each way throughout the line (on Saturdays the timings of the afternoon trains are some-

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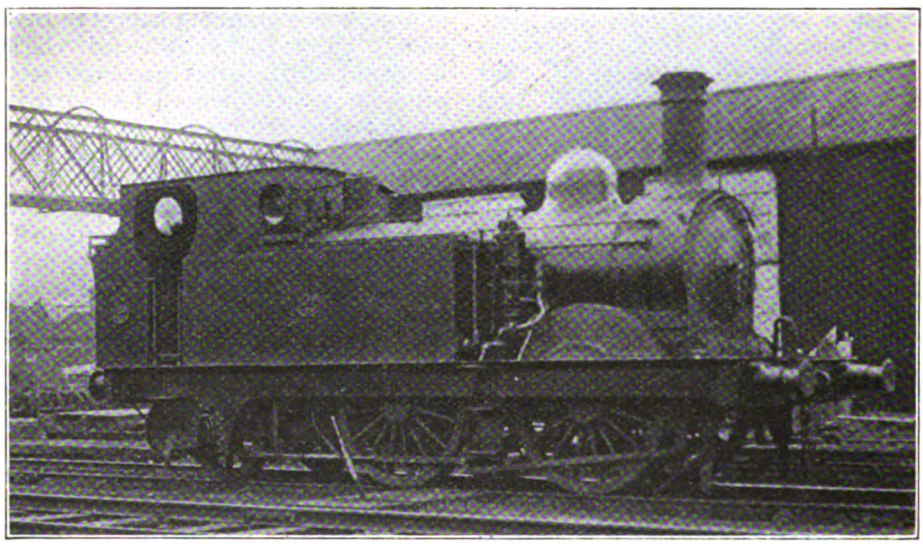
what altered), together with two or three local goods trips as required over sections of the line. As already pointed out, the heaviest traffic occurs from Hedingham and Halstead eastward, though there is a fair amount to and from Haverhill. It consists largely of grain, bricks, hay and straw, agricultural machinery, joinery, light and heavy iron castings and live-stock, together with coal and mineral traffic as required to meet the needs of the district, and a considerable tonnage of general merchandise. At Halstead, a town of some 7,000 inhabitants, there are



OLD 0-4-2 TANK ENGINE, No. 1.

several large industrial undertakings, including Courtaulds' silk mills, Portway's foundry, Clover Ltd., millers, Hugh Brown & Co., tanners, besides a number of lesser works. Near Hedingham there are extensive brick works, served by private sidings. Ripper's steam joinery works adjoin the station, and they also have private sidings. At Earls Colne, Messrs. Hunt's agricultural machinery works may be mentioned.

The locomotive stock consists of five locomotives, now known as Nos. 1, 2, 3, 4 and 5, though, in the past, Nos. 2, 3 and 4 bore the names of *Halstead*, *Colne* and *Hedingham*, respectively. No. 1 is an old 0-4-2 tank engine, built in 1877 by Neilson and Co., very similar to Great Eastern engines of the period. It has cylinders 15 in. by 22 in., and coupled wheels 5 ft. 3 in. diameter. In 1888 the engine was partially rebuilt by Hawthorn, Leslie and Co., at Newcastle-on-Tyne, still retaining the Salter safety valves on the dome originally fitted. In 1894 it was further rebuilt at Stratford, and in 1911 received attention at Halstead, involving the removal of supplementary water tanks alongside the smokebox, fitted by Messrs. Hawthorn, Leslie and Co., the addition of Ramsbottom safety valves, and other changes. The old engine, of which a photograph is reproduced, is now reserved for emergency and odd-and-end duties. Nos. 2, 3 and 4 are 2-4-2 side tank engines, suggestive of older Lancashire and Yorkshire Railway practice. They were built by Hawthorn, Leslie and Company, Nos. 2 and 3 in 1887 and No. 4 in 1894, and have cylinders 16 in. by 24 in., and 5 ft. 3 in. coupled wheels. No. 5 was built in 1908 by Hudswell, Clarke and Co. It is a 0-6-2 tank engine, having 16 in. by 24 in. cylinders, and 4 ft. 6 in. coupled wheels, and weighs in working order 50 tons. It is considerably more powerful than any of the others, and is reserved almost exclusively for goods traffic, which at times entails fairly heavy loads. It is usually in steam 15 hours daily and double-crewed. On the occasion of the writer's visit it was in hospital, so

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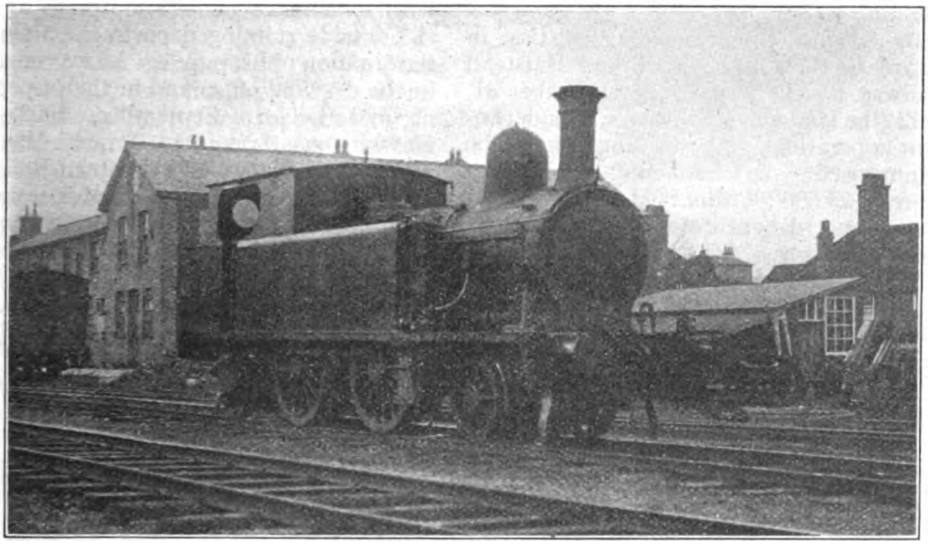
that one of the 2-4-2 tank engines had to work the goods traffic. Ordinarily, one of the latter engines works the passenger trains, relief arrangements being made to cover the 12 hours or so it is required to be in service each day, while another of the same class works the morning passenger trips between Hedingham and Chappel, and the odd goods trips, otherwise constituting the reserve engine in steam. With No. 5 temporarily laid up the third 2-4-2 engine had to work the principal goods trains.

In earlier years the Colne Valley and Halstead Railway had its usual complement of chief officers suited to a small system, but since 1907 Mr. Elyot S. Hawkins, who came to Halstead from the Cambrian Railways in 1903 as General Manager and Mechanical Engineer, has acted as General Manager, Secretary and Engineer, assisted by Mr. S. T. Scillitoe, Accountant and Audit Accountant. These gentlemen have, of course, several responsible assistants, apart from the ordinary clerical staff, together with foremen concerned, respectively, with locomotive repairs, carriage and wagon repairs, and permanent way maintenance, and civil engineering work generally. At Halstead the repair shops have no machine equipment, except for a few hand tools, but appliances are available for lifting engines, carriages and wagons, and for carrying out all ordinary repair work. Heavy locomotive repairs are sent to Stratford Works or elsewhere to be done, but carriage and wagon repairs are done at Halstead, except the re-turning and re-tyring of wheels and axles. The Halstead staff undertake painting and other work. The company also manufactures and repairs its own sheets for goods wagons, and looks after ropes and other details. The total staff employed by the company is now 119.

Although the district served is mainly agricultural, there are several places of interest in the neighbourhood. About two miles from Halstead is the Round Church at Little Maplestead. This is one of the four known to exist in England. It was originally a preceptory of the Knights Hospitallers of St. John of Jerusalem and was founded in 1185 by Juliana de Burgo. The Round Church of this preceptory is now the parish church of Little Maplestead. It is especially interesting as being the latest and smallest, the diameter of the circular part being only 26 ft. and the whole length including the Apsidal Chancel, little more than 60 ft. The church was re-built in 1854. Hedingham Castle was built in the reign of Stephen in 1151, and Queen Maud, his wife, died there in 1152. In 1216 the Castle, when held for the barons, was



2-4-2 TANK ENGINE, No. 4.

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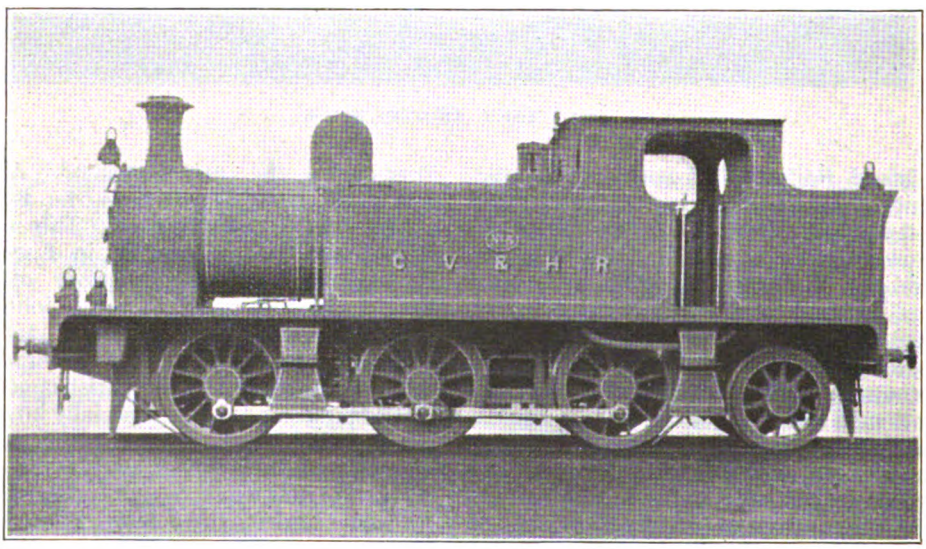
taken by King John. It was once visited by King Henry VII. The Keep, the only part of the castle now standing, is a square building 110 ft. in height to the top of the square turrets which rise at the angles, of which two only now remain. Up to about 1916 the main parts of the Keep were in good preservation, especially the banqueting hall, which contains a very fine example of a Norman Arch. During the war, however, the Keep was utilised as an observation post by the military and, owing to the over-heating of a stove in the soldiers' quarters, was completely gutted and only the shell now remains standing.

In conclusion, principal statistics in regard to the Colne Valley and Halstead Railway for the year ended December 31, 1922 (the last which will cover its independent operation and working), may be summarised as follows:—Preference shares, £25,590; ordinary shares, £61,200; Loans and debenture stocks, £429,210; gross receipts, £27,625; expenditure, £25,665; miscellaneous receipts (net), £1,961; total net income, £3,221; route mileage, 19; total mileage of single track, including sidings, 25; number of locomotives, 5; number of passenger train vehicles, 13; number of merchandise vehicles, 174; service vehicles, 1; road vehicles (horse), 8; number of horses, 3; number of passengers conveyed, first class, 1,372; third class, 159,826; workmen, 203; total, 161,401; number of season-tickets, 80; tonnage, merchandise, 47,278; coal, coke, patent fuel and minerals, 50,327; head of live-stock, 10,271.

Mr. E. S. Hawkins was educated at Shrewsbury School. For five years he then served as a pupil in the locomotive, carriage and wagon shops of the Cambrian Railways Company at Oswestry, going through all departments and concluding with experience on the footplate and in the outside running department. On the termination of his pupilage he was engaged in the drawing office and in the inspection of material. In September, 1903, Mr. Hawkins was appointed General Manager of the Colne Valley and Halstead Railway, with charge of the locomotive, carriage and wagon shops. In May, 1904, on the retirement of the then Secretary, he was also appointed Secretary and, in July, 1912, on the retirement of Mr. Fenn, became Engineer also. From August, 1914, until February, 1919, being in the Territorial Forces and holding a commission



0-6-2 TANK ENGINE, No. 5, USED FOR GOODS TRAFFIC.

As painted and lettered when first built. Constructed by Messrs. Hudswell, Clarke & Co., Ltd., Leeds. Coupled wheels, 4 ft. 6 in. diam. Cylinders, 16 in. by 24 in
Weight in working order, 50 tons.

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in the 4th Batt. K.S.L.I., Mr. Hawkins was absent on military service practically the whole of this time, until invalided home after being wounded in France in April, 1918. The first two and a-half years were spent in Burma, Singapore and Hong Kong, the remainder on the western front in Flanders and France. During this period, the Accountant, Mr. S. Rayner, was appointed Acting Manager and Assistant Secretary. Mr. Rayner died in February, 1920, after a lifetime spent in the service of the company and was succeeded by the present Accountant, Mr. S. T. Scillitoe.

Mr. James Williamson, Assistant Engineer of the Cambrian Railways, acted as Consulting and Inspecting Engineer from 1912 to 1920, and during Mr. Hawkins' absence on military duty supervised both the mechanical and civil engineering department.

The writer is indebted to Mr. Hawkins for facilities for inspecting the line, and for information utilised in the preparation of this article.

MR. ELYOT S. HAWKINS,
General Manager,
Colne Valley and Halstead Railway,
1903–1923.

THE RAILWAY YEAR BOOK.

Since its inception the "Railway Year Book" has been among the small number of really indispensable reference handbooks, and the change in the position of the British Railways brought about by grouping renders it more indispensable than ever. Full details of the amalgamation schemes are given in the 1923 edition (5s. net, 5s. 6d. post free, 33, Tothill Street, Westminster, S.W.1) while special interest attaches to the comprehensive details regarding joint lines not affected by grouping. A new feature of the railway "Whitaker" is a comparison of operating statistics for 1913 and last year, the latter on a grouped basis.—*The Financial News.*

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BRITISH RAILWAY SUPERINTENDENTS IN CONFERENCE AT PERTH.

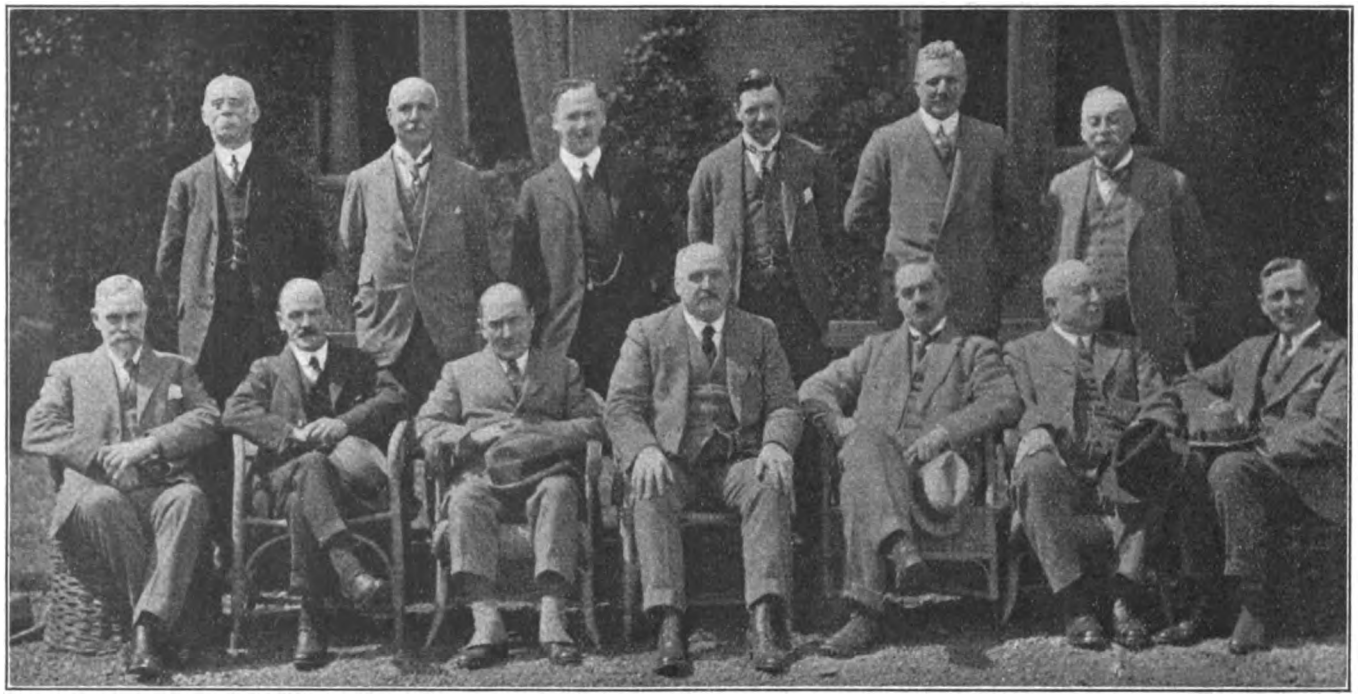

Photo.] [*Perthshire Advertiser.*

Front row (*left to right*).—Mr. M. S. Strang, Passenger Manager (Southern Scottish Area), London & North Eastern Railway; Mr. P. H. Price, Secretary, Railway Clearing House; Mr. C. J. Selway, Passenger Manager (Southern Area), London & North Eastern Railway; Mr. J. H. Follows, Chief General Superintendent, London Midland & Scottish Railway; Mr. R. Killin, General Superintendent (Midland Division), London Midland & Scottish Railway; Mr. W. Clow, Superintendent (Southern Area), London & North Eastern Railway; Mr. E. C. Cox, Chief Operating Superintendent, Southern Railway.

Back row (*left to right*).—Mr. J. Smyth, District Superintendent, Perth, London Midland & Scottish Railway; Mr. T. EcEwen, Assistant General Superintendent (Northern Division), London Midland & Scottish Railway; Mr. J. Ballantyne, General Superintendent (Northern Division), London Midland & Scottish Railway; Mr. Ashton Davies, General Superintendent (Western Division), London Midland & Scottish Railway; Mr. W. Holt, Traffic Manager, Metropolitan Railway; Mr. S. J. Webb, Chief Passenger Agent, Metropolitan District Railway.

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Around the North-West Coast by the London Midland and Scottish Railway.

By G. A. SEKON.

THE inclusion in one group of the various railways serving practically all of the counties of Cumberland and Westmorland together with north-west Lancashire, has given the London Midland and Scottish Railway a considerable length of coast-line in the north-west corner of England, serving several important towns and industrial centres, together with many favourite health resorts, practically all the way from Southport to Carlisle.

Southport is well known as a popular pleasure resort and a high-class residential district for people having their businesses in Liverpool and Manchester. Train communication is provided by the Cheshire Lines system and by the London Midland and Scottish Railway. Southport is the terminus of the well-known electric train service from Liverpool, which has been in operation for 19 years. Many of the electric trains continue through Southport a further distance of 3½ miles to Crossens, making the electrified coast section 22 miles in length. Chapel Street terminus is the principal London Midland and Scottish Railway station at Southport, trains from all parts of the system converging there, including through carriages from Euston *via* Edge Hill.

The coast line from Southport to Preston includes the old West Lancashire Railway, the Southport terminus of which is at the Central station. The West Lancashire Railway was incorporated in 1871, but was not completed through from its Southport terminus to Preston till September 4, 1882. These two stations, together with the lines leading to them, were opened on the same date, but intermediate sections had been brought into use previously, the earliest in February, 1878. The West Lancashire Railway had running powers over the Lancashire and Yorkshire Railway from Preston to Blackburn, and by means of the Liverpool, Southport and Preston Junction Railway, 7½ miles in length, connecting the Cheshire Lines Extension at Hillhouse Junction with the West Lancashire Railway at Hesketh Park, a competitive service between Blackburn and Liverpool was inaugurated, incidentally providing the partners in the Cheshire Lines with a route to the Blackburn district, independent of the Lancashire and Yorkshire Railway. In 1897, the Lancashire and Yorkshire Railway absorbed the West Lancashire Railway, and doubtless this destiny fulfilled the expectations of the promoters of the West Lancashire Railway. As already stated this line is electrified from Southport to Crossens. A few steam trains run through between Todmorden or Accrington and Southport by the direct line without calling at Preston.

From the joint station at Preston the coast journey takes us over what was, in the ante-amalgamation era, the Lancashire and Yorkshire and London and North Western joint line, managed by the Lancashire and Yorkshire Railway. The principal places served are Fleetwood and Blackpool. The main railway is away from the Ribble estuary, and from west of Poulton to Fleetwood follows the course of the River Wyre. At Kirkham North Junction, 8¼ miles from Preston, the coast branch to Blackpool (Central) commences. There are four sets of metals between Preston and Kirkham. By this coast route it is 13¼ miles from Kirkham to Blackpool (Central), but since the opening of the direct line much of the heavy holiday traffic has been diverted to the newer route. The coast line serves, however, the important residential coast towns of Lytham, Ansdell and St. Annes-on-the-Sea, to and from which places and Manchester and other Lancashire business towns an excellent service of express trains is provided. The direct line, opened in May, 1903, is 5 miles shorter than *via* Lytham and there is no intermediate station on it. It is mostly on embankment in a flat country.

The direct line re-joins the coast line

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at Waterloo Road station. The new station here was brought into use in the autumn of 1915, when extensive alterations and additions were made to the railway around this junction, including the doubling of the line thence into the Central station. Prior to the opening of the enlarged Waterloo Road station the South Shore district of Blackpool was served by a wayside station, a few chains south of the junction between the coast and direct lines, known as Lytham Road, which was closed when the Waterloo Road station was brought into use. Lytham Road was formerly generally designated South Shore, serving the North of Blackpool, and is 10¼ miles from Kirkham *via* Poulton, from which there are four lines The original Talbot Road station was the first railway station in Blackpool, having been opened in 1846. The excursion and general stations at Talbot Road are quite distinct, the nine platforms of the former commencing on the north side where those of the latter end. The main station has six platforms. Regular and excursion trains from most parts of the North and Midlands are run to Blackpool, particularly in the summer. Despite the immensity of the railway accommo-

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*F. E. Mackay.*

Whitehaven–Lancaster train on L. & N.W. section. Furness 4-6-4 tank engine, No. 117.

and when dismantled, and platforms at Waterloo Road constructed in its place, it was generally assumed that Waterloo Road would be re-named South Shore, with a view to encouraging passengers to alight there instead of continuing in the train to the Central station, 1¼ mile distant. Between Waterloo Road and the terminus four running roads are provided together with 23 sidings for passenger rolling-stock. The extensive locomotive shed is between the two stations. The Central station is in two sections—general and excursion. The former has six, and the latter eight platforms.

Talbot Road station is a terminus

dation provided at Blackpool, the pressure is so great that at week-ends the seating in the trains has to be rationed—travellers being permitted to travel only by the train indicated on their tickets.

One and a-quarter miles north of Talbot Road is Bispham, with a ticket-collecting platform a quarter of a mile in length. At Poulton there are triangular junctions, enabling trains from Talbot Road to run into Poulton or direct to Fleetwood, the third side of the triangle forming the direct Poulton-Fleetwood line. Between Poulton and Fleetwood is Thornton, the station for the immense war-time camp at Cleverleys. Approaching Fleetwood the Wyre

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Dock of the late Lancashire and Yorkshire Railway, opened in October 1877, is passed. The railway steamship service from Fleetwood to Belfast forms one of the chief routes to Northern Ireland, the fine steamers being ocean liners, except in tonnage. Express trains connecting with incoming and outgoing boats are run between London and other important towns and Fleetwood. Across the mouth of the Wyre from Fleetwood is Knott End, the coast terminus of the Garstang and Knott End Railway, incorporated in 1864 and opened from a junction with the then London and North Western Railway the main line up which we have travelled to Lancaster. There is a spur into Castle station, Lancaster, half-a-mile in length, leading from the Midland station known as Lancaster (Green Ayre), on the Midland line from Wennington to Morecambe.

Proceeding along the London and North Western section for 2 miles we reach Hest Bank South Junction, where the London and North Western line to Morecambe diverges, the distance thence to the terminus being about 2 miles. A connection is made between the Midland and London and North Western sections at Morecambe. The Midland station at Morecambe is

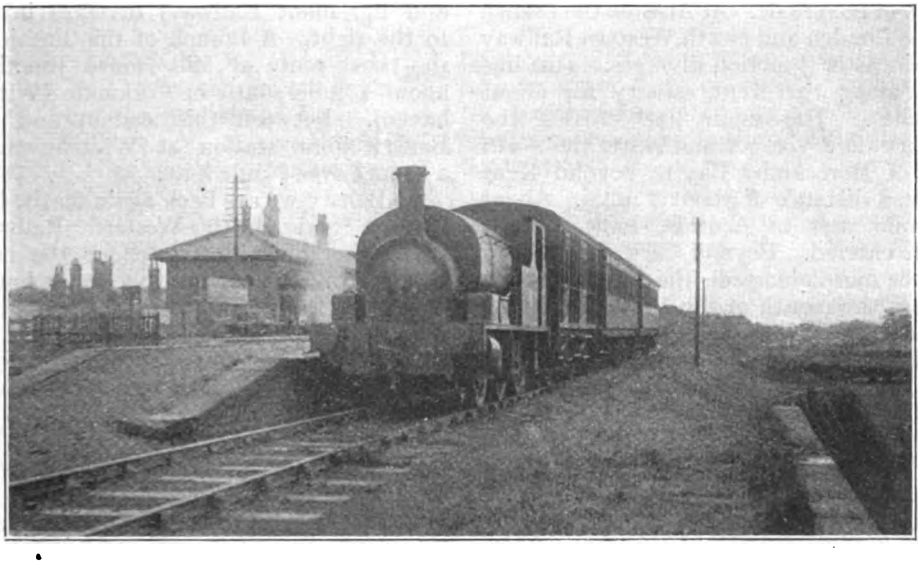

Photo.] **GARSTANG AND KNOTT END TRAIN AT GARSTANG.** [*K. A. C. R. Nunn.*
Engine "Jubilee Queen." Photograph taken in 1912.

at Garstang and Catterall to Pilling in December 1870, a distance of 7 miles. The 4½ additional miles to Knott End were only completed during recent years. This single line railway has been absorbed in the London Midland and Scottish system.

Continuing our journey over the main line of the old London and North Western Railway from Garstang and Catterall for 11½ miles, we arrive at the Castle station, Lancaster. Here a single-line branch, 4½ miles long, runs from north to south down the side of the Lune to Glasson Dock at the river mouth. This line is practically parallel for its length with fairly commodious. The Midland Railway sought to make Morecambe as important a holiday centre for the Bradford and Leeds district as Blackpool is to the industrial districts of Lancashire. Prior to the development of Heysham Harbour, the Midland supported steamship services between Morecambe and Northern Ireland. The extension from Morecambe to Heysham is about 4 miles in length. The extensive harbour there, from which ply steamers to Belfast, was brought into operation in September, 1904.

After leaving Morecambe (London and North Western), to follow the coast, we travel back over the branch to Bare

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Lane Junction, rejoining the main line at Hest Bank North Junction. The railway here for some distance, runs directly alongside the sea. At Carnforth, which station the London and North Western, Midland and Furness railways used prior to grouping, we transfer to the Furness section. In the summer, Furness Railway trains used to work regularly over the London and North Western railway between Carnforth and Morecambe, and also summer and winter between Hincaster Junction and Kendal. For some distance the Furness line runs along the seashore, then striking inland, crossing from Lancashire to Westmorland about a mile north of Silverdale. At Arnside the branch to the London and North Western Railway at Hincaster Junction diverges. This line runs along the Kent estuary for about 3 miles. The main line crosses the estuary on a viaduct and skirts the north side of Morecambe Bay to beyond Kent Bank, a distance of about 4 miles. About 1¾ mile west of Arnside, Lancashire is again entered. Beyond Cark the railway is once more alongside the shore, until it crosses the mouth of the Leven by a long viaduct. On the west side of the viaduct is Plumpton Junction with Y-lines for the Windermere branch, and a facing junction for the mile-long single branch to Conishead Priory, over which at one time there was a passenger service—one train daily in each direction.

The Furness line does not strike the coast again till Barrow is reached, with its complex networks of lines, important docks, and Central and Dock stations. The Dock station was of considerable importance prior to the inauguration of steamship services from Heysham. The branch from Salthouse Junction, Barrow, to Piel, 4 miles in length, is single. Many years ago the Belfast steamers sailed to and from Piel Pier— a long stone breakwater. From Barrow the Furness main line runs north, and from Askham to Foxfield—5½ miles—is along the bank of Duddon estuary. At Foxfield (Lancs.) the branch to Coniston diverges. The main line crosses the Duddon river and follows the Cumberland side of the estuary to Millom, whence a mineral branch 1¾ miles long, runs down to the sea at Hodbarrow. The main line then turns north and continues parallel with the sea coast, but some little distance from it, to Ravenglass, with a viaduct on either side of the station. At Ravenglass passengers change for the 15-in. gauge Eskdale Railway to Boot. The original Ravenglass and Eskdale Railway was opened in 1875, on the 2 ft. 9 in. gauge; the 7 miles now worked were converted to the 15 in. gauge and re-opened in 1915.

At Brigg the Furness line again reaches the coast, and continues along the shore for about 9 miles to St. Bees Halt; there are several minor seaside resorts on this section, Seascale being the chief. At Sellafield, the late North Western and Furness Joint line (Whitehaven, Cleator and Egremont Railway) diverges inland to the right. A branch of this line joins the coast route at Mill House Junction, about a mile south of Corkickle (Whitehaven). Between this station and the Bansty joint station at Whitehaven is a tunnel over ¾-mile long.

At Bansty we are back again on the late London and North Western Railway, whose line hugs the coast for the next 12 miles to Maryport, with a *detour* inland to avoid the "front" at Workington. This is the great iron district of Cumberland, and pits and works are numerous, as are junctions with the late North Western and Furness Joint line, the Cleator and Workington Railway, and the London and North Western branch from Cockermouth. At Maryport is an end-on junction with the late Maryport and Carlisle Railway.

The Maryport and Carlisle runs (away from the coast) to Carlisle, where it joins the main section of the London Midland and Scottish Railway, of which it is one of the subsidiary companies. Our tour over the North West Coast section of the London Midland and Scottish Railway therefore ends at Maryport, or to complete the circuit, at Carlisle. Through coaches work between Euston, Manchester, etc., *via* Barrow and Whitehaven, from Leeds, etc., on the Midland section to Barrow, and in the season to Lake Side.

It may be mentioned that from Brayton, on the Maryport and Carlisle section, there is a Caledonian branch line which enters England by means of the Solway Viaduct at the confluence of the Eden and Eskdale, but in consequence of the unsatisfactory state of the viaduct, there is at

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present no train service by this route. The line from Carlisle to Carnforth above described forms an important alternative route to the main line between these points, and when rearrangements are made in the services of the lines now forming the London Midland and Scottish Railway, increased facilities over the section may be expected. Already through trains work between Carlisle and Carnforth *via* Whitehaven, and also between Carlisle and Keswick *via* Brigham and Cockermouth, and *vice versa* in each service.

RETIREMENT OF COL. L. B. BILLINTON, C.B.E.,

LOCOMOTIVE ENGINEER, L.B. & S.C.R., 1912-1923.

COL. LAWSON B. BILLINTON, C.B.E., who retired on June 30 from the position of Locomotive Engineer of the "Brighton" Section of the Southern Railway, had had charge of locomotive construction, maintenance and operation, including the works at Brighton and the sub-shops elsewhere on the London, Brighton & South Coast Railway system, since 1912.

Son of the late Mr. J. R. Billinton, a former Locomotive Engineer of the "Brighton" Railway, Col. Billinton was educated at Tonbridge Public School, after which he entered the London, Brighton & South Coast Railway Works at Brighton as a pupil. Later he became inspector of work in hand at contract shops for the Company, and was associated with locomotive trials, including those with oil fuel. He was then appointed Assistant District Locomotive Superintendent at New Cross, and later becoming Chief Superintendent there. In 1912 he was selected to succeed Mr. D. Earle Marsh as Locomotive Engineer.

He rendered special services during the war. He was gazetted a Lieut.-Col., R.E., in March, 1917, and served in Roumania, the Caucasus, Turkey and Russia, being mentioned in despatches. He was awarded the C.B.E. by the British Government, and was made a Chevalier of the Cross of Roumania.

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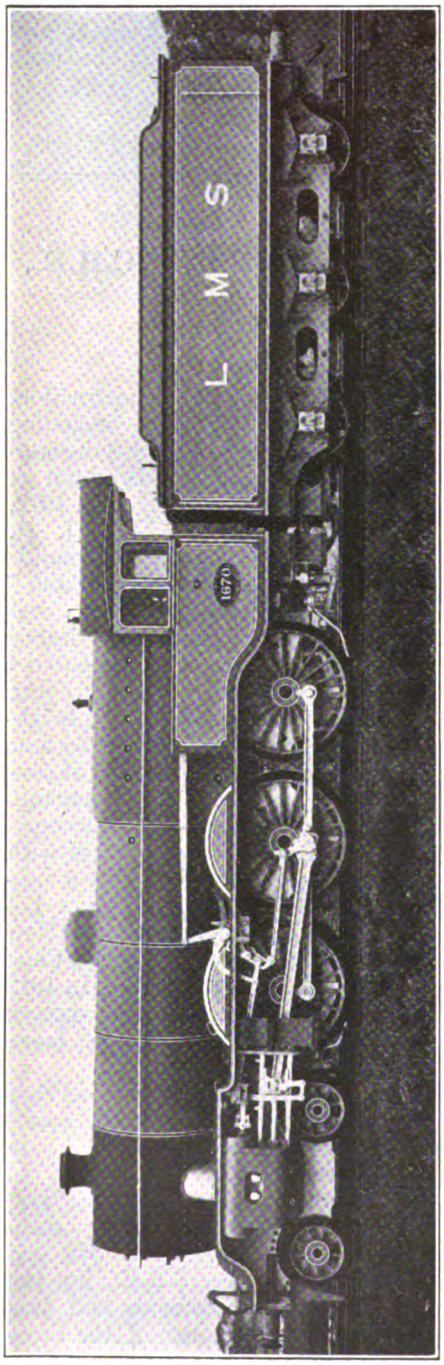
New 4-6-0 Express Locomotive,



NEW 4-6-0 LOCOMOTIVE, LONDON MIDLAND AND SCOTTISH RAILWAY.

LONDON MIDLAND AND SCOTTISH RAILWAY.

BY the courtesy of Mr. George Hughes, C.B.E., Chief Mechanical Engineer, London Midland and Scottish Railway, we are enabled to reproduce herewith a photograph showing one of a further series of 4-6-0 type 4-cylinder express locomotives recently built at Horwich. These engines are practically identical with the previous ones of the same class in their latest form, but are equipped with larger tenders, which latter are of a new design having a capacity of 3,000 gallons of water and 6 tons of coal, compared with 2,480 gallons of water and 5 tons of coal of the earlier and smaller tenders. The tender is fitted with water pick-up apparatus. It is lettered L.M.S.

Wheelbase of the engine and tender is now increased from 48ft. 3½ in. to 50 ft. 3½ in.

The total weights in working order are:—

	Tons	Cwt.
On bogie	19	15
Leading drivers	20	0
Intermediate drivers	19	17
Trailing drivers..	19	9
On tender wheels	40	0
Total	119	1

General dimensions are:—

Cylinders (4)	16½×26 in.
Boiler—	
Length between tubeplates	14 ft. 8 in.
Maximum inside diameter ..	5 ft. 8¼ in.
Minimum ,, ,, ..	5 ft. 7 in.
Tubes	157 2 in. diam.— 28 4¾ in. diam.
Tube heating surface ..	1,717 sq. ft.
Firebox heating surface ..	176 sq. ft.
Total ,, ,, ..	1,893 sq. ft.
Superheater heating surface..	430 sq. ft.
Grate area	27 sq. ft.
Total weight engine and tender (working order) ..	119 tons 1 cwt.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

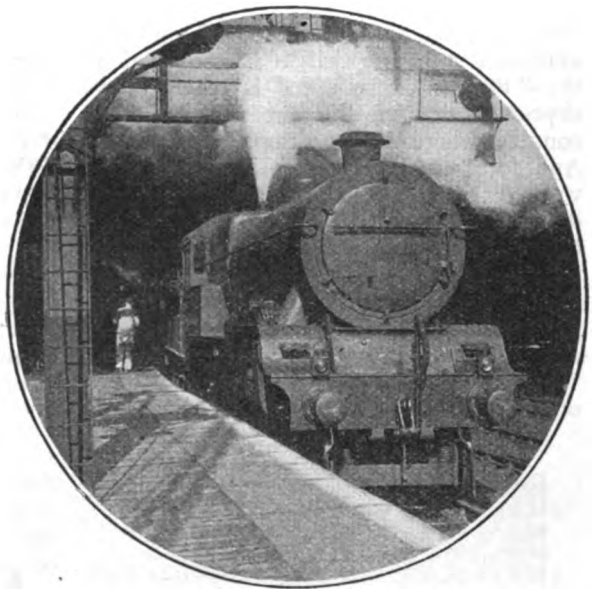

Photo.] [*Chas. S. Lake.*

LONDON MIDLAND AND SCOTTISH RAILWAY.

L. & Y. latest pattern 4-cylinder 4-6-0 express locomotive on Blackpool Club Train at Victoria Station, Manchester.

SCARCELY had there been delivered the historic newspaper pronouncement on railway speeds on which I ventured to comment in my June article, when another daily journal which has had hitherto a widely accepted reputation for sobriety of utterance, took the field. This was the *Westminster Gazette*, of May 31 last, the source of the mysterious statements that we heard on all hands concerning the "80-miles-an-hour expresses" of our summer train services. The latter journal refuted the contentions of the former as to the undue sloth of British express trains, and positively made our flesh creep with excitement as the amazing developments of the summer of 1923, and the equally amazing discoveries which had made them possible, were outlined for us. Lest any of the gems of this second effusion should be lost, I reproduce them practically in full, together with a few reflections suggested to me in the course of reading.

We will start right away at the beginning:—

"EIGHTY MILES AN HOUR.
"SUPER-EXPRESSES IN JULY.
"SURPRISING DISCOVERY.
"HIDDEN POWER OF MODERN ENGINES.

"From Our Railway Correspondent.

"I am informed that express trains, attaining speeds hitherto unheard of in British railway history, will be run by at least one of the companies when the accelerated summer services begin on July 9." The highest speed hitherto "heard of" in "British railway history" being 102·3 m.p.h., it would be necessary for the new trains to travel at 102·4 m.p.h. at least in order to fit in with this prognostication. The historical knowledge of "Our Railway Correspondent" is, however, somewhat limited, for he adds: "It will be possible for the super-expresses to develop speeds between stops of about 80 miles an hour. Great secrecy is being observed by the principal lines. I learn that the Great Western group are the pioneers in this high-speed movement, and there are indications that at least one other group will follow their example as soon as possible. Time-table arrangements are now under consideration, and in about a fortnight's time an official announcement and full details of the 'flying expresses' will be published." The mixture of *naïveté* and nonsense in this paragraph is about in equal proportions. As regards the nonsense, there are probably fifty occa-

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sions at least, if not a hundred, on any average day in the British Isles on which the "80" mark in speed is reached by express trains in different parts of the country, where the conditions are suitable. And for pure *naïveté* the idea of hard-worked time-table staffs calmly sitting down round about the end of May to think out train services arrangements for July, and to make their staggering speed announcements in "a fortnight's time," has a peculiar humour about it that only a time-table man will really appreciate.

And now we come to the technical side of the business. "A surprising feature of this development in express traffic is that locomotives already in commission will be utilised. It has been found, in recent tests, that the engines are capable of attaining these high speeds without difficulty, and that the principle of 'Safety First' is in no way sacrificed." One would be deeply intrigued to know who made this valuable discovery of the "Hidden Power of Modern Engines" here referred to, and stressed in the title of the article. And in what part of the engine or tender, too, was it "hidden"? Some of our famous locomotives must have been "dark horses" indeed to have concealed their tractive powers during so long a period of their "commission." But now, as is quite clear, they are to be compelled to disgorge them for the benefit of the travelling public.

After this comes an attack on the *Morning Post* writer. "This development of the express service is a complete answer to recent criticisms of railway enterprise. One writer lamented the fact that, with the exception of the 'Southern Belle,' our express trains were no longer called by pet names, as formerly. This, it was argued, destroyed our former attitude of looking at an express train as something rather 'sporting.' He apparently overlooked the fact that what is appreciated is comfortable travelling, with safe and easy running, rather than excessive speed; and it is still the proud boast of our British railways that in these respects they are second to none. All questions of economy, either in locomotive construction or running, were cheerfully derided. 'Safety First' was, in this critic's view, apparently to be disregarded and 'Speed First' substituted." Here the attack of "Our Railway Correspondent" becomes more trenchant than mine; I had not ventured to suggest so dangerous a motive in the mind of the *Morning Post* writer. "A list of trains was given showing the time occupied between certain places, and mileage rate per hour, but

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*W. Rogerson.*

Up goods train passing Cowton. North Eastern 4-6-0 goods engine No. 840, class S 3.

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nothing was stated regarding any intermediate stops made by any of them, nor was anything adduced to demonstrate that insufficient engine power set the pace."

The trouble was, in brief, that the *Morning Post* writer was unacquainted with that "Hidden Power of Modern Engines" which his *Westminster Gazette confrère* now revealed to him! And then, in conclusion: "To date the Great Western Company holds the world's speed record with their Cornish Riviera express. This record will apparently be 'put in the shade' by the super-expresses of July." One had previously supposed the Paddington–Bath slip services on the Great Western to take a considerably higher place, on the basis of start-to-stop scheduled speed, than the "Riviera" express, and that certain expresses on the North Eastern and Great Central sections of the London and North Eastern came higher up still. When will British newspapers learn the desirability of having as their "Railway Correspondents" gentlemen who have some nodding acquaintance with railway *facts*, or who, at least, when they write "I am informed," see to it that they are informed by someone who knows what he is talking about?

My remarks in the June issue in regard to the punctuality of British train services, by the way, received a striking and quite unsolicited confirmation in a letter I have just received from a naval correspondent. "With the object of further testing this question," he writes, "I went round to several London termini on an evening during last week, and took the time of arrival of several expresses. The accompanying table shows the results; my watch was checked by the station clock at each station visited, and I can guarantee the arrival times to the nearest half-minute. I should like to add the assurance that no express trains which arrived during the period I was at each station have been omitted from the table."

Station of arrival.	Train from	Due	Arrived.
		p.m.	p.m.
Victoria, L.B. & S.C.	Portsmouth	5.32	5.30½
Marylebone G.C.	Manchester	6.38	6.37
Paddington, G.W.	Penzance ..	6.50	6.50
	Bristol ..	7.00	6.59
	Birmingham	7.17	7.17
Euston, L. & N.W.	Liverpool & Manchester	8.10	8.07
	Birmingham	8.20	8.20
St. Pancras, Mid.	Manchester	8.35	8.35½
	Sheffield	9.05	9.05
	Glasgow	9.15	9.16
King's Cross, G.N.	Leeds, &c.	9.30	9.27½

This is a remarkable record. Some of the trains concerned are the fastest in the country; the 5 p.m. from Bristol by the Great Western Railway, for example, allowed 120 min. for the 117·6 miles via Badminton, with a slack at Reading, is one; the Great Central express is the fastest of all its up trains, with only 110 min. allowed from Leicester; the North Western 8.20 p.m. is one of the 19-min. trains from Birmingham to Coventry, with the Coventry stop included in its two-hour schedule to Euston; and the second and third of the Midland trains, one with 77 min. allowed from Kettering and the other with 107 min. from Leicester, are both worked on the fastest timings of that railway. For weight, the 8.10 p.m. into Euston (although doubtless piloted), would want some beating; and my friend adds that the 9.30 p.m. into King's Cross was brought in by a "Pacific" with 15 cars in the formation, reckoning the quintuple dining car set as five. The latter would be a train of at least 450 tons gross weight, and yet, despite the bad p.w.r. check which was in force at the time at Hatfield, arrived 2½ min. early.

The same question of relaying delays probably applied all round, the relaying "season" being then in full swing—this would certainly affect the Midland times, as I know that there were several "cautions" in force on the Midland at that time—and the record of punctuality is on that account the more strikingly creditable. There are times, as we all know, when punctuality is impossible. No matter how excellent may be the arrangements made, it is idle on a Saturday in midsummer, for example, to expect railways conveying almost exclusively holiday traffic in successions of trains of vast length and weight, to keep strict time. The Great Western and Great Eastern lines are bad sufferers in this respect, and often do well in week-

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end working conditions of extraordinary complexity and difficulty. Thus the country that maintains far higher all-round express speeds than any other in the world—and we are proud to claim that country as our own—need fear nothing by comparison with any other on the score of punctuality of express train running.

The North Eastern runs which follow are given chiefly because it is now a matter of years since last I had anything to say in regard to the East Coast main line from Darlington northwards to Edinburgh. Up to the time at which I am writing the running over these sections has been devoid of any great interest, on account of the unduly easy character of the schedules. Between Darlington and Newcastle there is at present only one serious "out-of-course" speed restriction owing to colliery workings —at Lamesley—and thus, even allowing for the usual Durham slowing, allowances of 50 min. or so for the distance of 36 miles between these points are excessive. Similarly the Newcastle–Edinburgh bookings, with the customary Morpeth and Berwick slowings, and one "pitfall," near Widdrington, are extraordinarily generous, the ascents to Grant's House from either direction, in particular, inspiring a respect in the breasts of time-table clerks which is hardly warranted by their severity, the very worst incline being the 4¼ miles at 1 in 96 on the north side. Consequently the very briefest reference to the features of most of the runs will suffice.

The first table relates to runs from York to Newcastle, in the first three instances by the 9.38 a.m. out of York, which is booked through Darlington in 45 min. from the start. Except for a somewhat leisurely start, No. 1244 put up the best running, covering the 38·6 miles from Beningbrough to Darlington in 36 min., at an average of 64·3 m.p.h. Speed was maintained at about the latter figure as far as Sessay, rose to 67 at Thirsk, 69 at Danby and 68 at Croft, where we were "eased," with minima of 62½ at Northallerton and 64 at Eryholme. After this no higher speeds were reached than 66 m.p.h. at Croxdale and 64 at Birtley, but we arrived 4 min. early, despite checks. The second run was quite featureless. On the third we began excellently to Beningbrough, and continued quite well to Darlington, where we

Photo.] [*Henry L. Salmon.*

LONDON AND NORTH EASTERN RAILWAY TRAIN ON LONDON MIDLAND AND SCOTTISH RAILWAY.

Newmarket–Leicester horse-box special near Leicester. Great Eastern 4-4-0 rebuilt locomotive No. 732.

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had bettered " even time." Speeds ranged between 64½ m.p.h. at Alne, 61 at Pilmoor, 65 at Thirsk, 64½ at Northallerton, 70½ at Danby, 64½ at Eryholme and 68 at Croft. Up the 1 in 203 beyond Bradbury 53½ m.p.h. was the lowest speed, and we touched 64½ at Croxdale, but then came the usual delays, culminating in ¾-min. dead stand for adverse signals at King Edward Bridge Junction. For all that we to so vast an engine. Intermediate speeds, as will be seen in the table, were considerably lower than those in the three preceding columns; in fact, 61½ m.p.h. at Alne, was the highest rate attained. I may add, however, that the same driver (Blades, of Gateshead) did very well with No. 2400 on comparative trials with G.N. " Pacifics," which took place over the G.N. main line early in July. At the

L. & N.E. (NORTH EASTERN) RAILWAY. YORK—NEWCASTLE.

Distance.	Engine No.: / Engine Type: / Load (axles): / ,, (tons tare): / ,, (tons full):	Schedule.	1244 R1 30 207 220		2201 Z 30 207 220		2207 Z 30 207 220		Schedule.	2400 4-6-2 34 222 240		Schedule.	2401 4-6-2 40 273 290		Schedule.	2164 Z 50 345 365	
Miles.		Min.	M.	S.	M.	S.	M.	S.	Min.	M.	S.	Min.	M.	S.	Min.	M.	S.
0·0	York	0	0	00	0	00	0	00	0	0	00	35	35	25	49	50	15
										sigs.							
1·6	Poppleton Junction	3	3	50	3	40	3	35	4	5	45	32	31	40	45	46	50
5·5	Beningbrough ..	—	8	35	8	20	7	50	—	10	45	—	27	50	—	43	10
																sigs.	
11·2	Alne..	13	14	05	13	45	13	15	14	16	35	22	22	15	36	33	00
16·1	Pilmoor	—	18	40	18	35	18	00	—	21	30	—	17	30	—	28	25
22·2	Thirsk	24	24	20	24	25	23	45	27	28	05	11	11	05	25	23	05
										sigs.							
30·0	Northallerton ..	32	31	30	32	15	31	00	11	12	25	19	19	15	17	16	20
33·7	Danby Wiske ..	—	35	00	36	00	34	25	—	5	50	—	14	40	—	12	45
38·9	Eryholme	40	39	45	41	20	39	10	12	11	00	—	9	00	7	7	40
44·1	Darlington	45	44	35	46	30	44	00	19	17	35	30	29	40	50	46	55
			sigs.														
49·5	Aycliffe	—	51	05	52	45	49	45	—	—		—	23	10	—	40	25
57·0	Ferryhill	59	58	45	60	55	57	35	—	—		15	14	50	35	32	55
							p.w.r.										
66·1	Durham¶	72	69	10	71	50	69	30	—	—		22	24	15	20	19	45
			p.w.r.														
71·9	Chester-le-Street ..	—	76	20	78	50	77	20	—	—		—	14	55	—	12	10
			p.w.r.		p.w.r.		p.w.r.						p.w.r.				
78·9	Bensham	—	84	30	87	00	85	00	—	—		—	4	15	—	3	50
							sigs.										
80·1	Newcastle	92	88	00	90	30	90	40	—	—		0	0	00	0	0	00
80·1	Net times (min.) ..	92	86½		90½		87		57	54		106	108½		99	91	

¶ Severe service slack over viaduct.

arrived over a minute early. Net times, which range from 1½ to 5½ min. under schedule do not allow for the Lamesley pit-fall check. It is surprising that not so much as a minute is cut from this schedule in the summer accelerations, when even the night " sleepers " are speeded up to a 90-min. run from York to Newcastle.

In the next column is seen a mediocre run behind the first of the new " Pacifics," on the 8 p.m. out of York, with a very light train. The load was a mere featherweight time of writing I have not contrived a run behind No. 2400 on these duties, but we met the engine at Stoke summit " in full cry " on the 5.40 p.m. the other night, well on time with a 70-axle train, despite one or two p.w.r. cautions which were in force *en route*.

The up run, with No. 2401, on the 4.50 p.m. out of Newcastle, was a poor exhibition, time being dropped by the engine almost throughout. We crawled out over the King Edward Bridge as

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though the whole day were before us, never got above 48½ m.p.h. beyond Low Fell—as against a customary "Atlantic" figure of a mile-a-minute, or thereabouts—did not reduce below 36 m.p.h. at Lamesley "caution" and then positively *fell* in speed to 35 m.p.h. up the short 1 in 231–150 to Birtley. The 1 in 150 beyond Chester-le-Street, again, brought us down to 36 m.p.h. —with less than 300 tons. The consequence was that 2¼ min. were thrown away to Durham. Leaving there we took a bank engine in rear, to my great surprise, just as the "Atlantics" do, to Relly Mill Junction, and then pottered along in leisurely fashion to Ferryhill, after which we did manage to attain 64½ m.p.h. on the falling grades to Darlington, over which we gained ¼-min. On the easy booking of 19 min. from Darlington to Northallerton we lost 15 sec., not getting above 48·4 m.p.h. to Eryholme, and at no point to 60 between there and Northallerton. On the last level stage, from Northallerton to York, we contrived to lose another 25 sec., making a wretched start to Otterington (where we were only doing 51½ m.p.h.), and not so much as reaching the mile-a-minute rate until we were nearly to Pilmoor. After that we touched 64½ m.p.h. at Alne. The work of No. 2400 over the G.N.R. clearly proves that the fault did not lie with the engine. "I canna haud her in! I canna haud her in!!" exclaimed the driver of No. 2401 excitedly to me when I walked up at Darlington, to see if anything was wrong; a little less of the "hauding in," however, would have given the engine a decent chance of showing her capabilities.

I have put the fine work of "Atlantic" No. 2164 in the last column, just by way of comparison. We had no Lamesley slack, it is true—this cost No. 2401 little, if anything, more than 1 min.—but passed Durham in 4½ min. less than No. 2401 took to stop; and that with a load of 365 tons as against 290 tons. To Darlington we gained over 3 min., and that despite ½-min. or so delay by signals as we entered the station. Speed at Aycliffe was 70½ m.p.h. And then, after leaving Darlington, there followed the extraordinarily fine run to York which I described recently amongst the journeys on the 43-minute "flier," wherein we sustained 72½ m.p.h. past Thirsk, did not fall below 69 at Pilmoor, and were going gaily at 72½ again when pulled up dead by adverse signals at Alne. At least 9 min. net gain would go to Driver

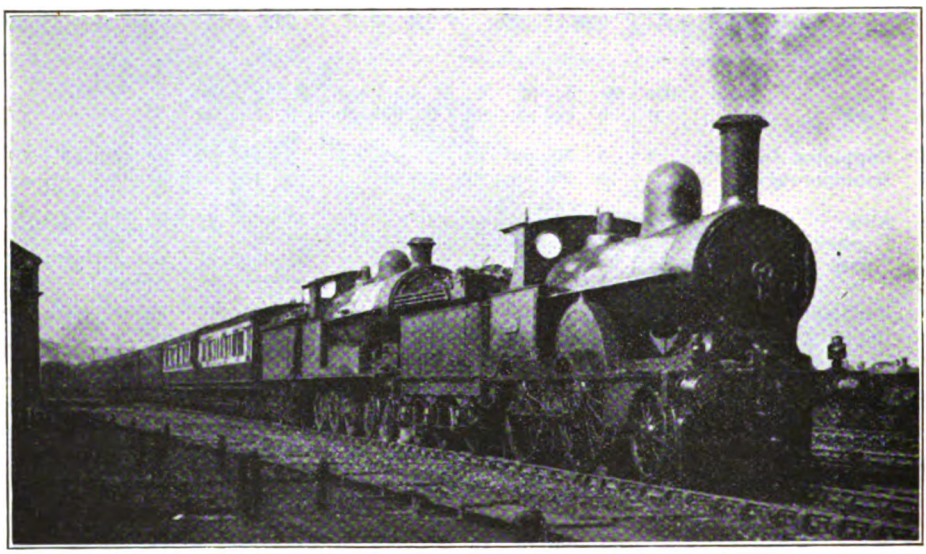

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Henry L. Salmon.*

8.30 a.m. Up Manchester and Halifax Luncheon-Car Express leaving Rugby.
London and North Western locomotives: 2-4-0 No. 2193, "Salopian," and 4-6-0 No. 1535.

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Linfoot between Newcastle and York on that splendid trip, and the contrast in driving methods between the two runs is very striking.

At this stage I must mention an exceedingly fine run which I have just enjoyed behind a "Z" class "Atlantic," on the 9.18 p.m. 45-minute express from York to Darlington. This is a considerably heavier train than the 43-minute up train; the normal load is one of nine vehicles, and on this particular night the gross tonnage was fully 300. No. 2170 was the engine, under the capable charge of Driver Robinson, of York shed. It took us 4 min. 5 sec. to get round the curves to Poppleton Junction, and 8 min. 40 sec. to Beningbrough, where we had just attained the mile-a-minute rate; from there we accelerated to 67 m.p.h. at Tollerton and 69 at Alne, passed in 14 min. exactly. Thenceforward right through to Eryholme the speed never once dropped below 68 m.p.h., and all my records in this direction of running were broken by the attainment of a maximum of 75 m.p.h. just beyond Danby Wiske. The 36 miles from Beningbrough to Croft were covered in 32 min. exactly, and the 29·2 miles from Tollerton to Eryholme in 25 min. 35 sec., at a throughout average of 68·5 m.p.h. Pilmoor was passed in 18 min. 25 sec., at 68 m.p.h.; Thirsk in 23¾ min., at 72½ m.p.h.; Northallerton in 30 min. 35 sec., at 68 m.p.h.; Danby Wiske in 33 min. 50 sec. ("even time"), at 74 m.p.h., immediately after which we touched 75; and Eryholme in 38¼ min., at 70½ m.p.h. The engine was now severely "eased," and we rolled gently down to Darlington at about 64–65 m.p.h., effecting a stop in 44 min. 25 sec. A quick finish would have brought us to the stop in under 44 min. Driver Robinson confided to me that he likes a "load for the engine to get hold of," and proved it, indeed, by stopping in Darlington the night before, on the stroke of 10.3 p.m., with two "extras" in the formation, the total weight of the 46-axle train being fully 360 or 370 tons. Running of this character will challenge any performed over the Great Western Bristol main line in the west-bound direction, the tendency of the line in both cases being slightly against the engine almost all the way.

Photo.] **GREAT NORTHERN RAILWAY, IRELAND.** [*S. B. Jackson.*

Local train at Dunmurry. 4-4-2 tank engine No. 187.

Nine runs appear in the second table, from Edinburgh down to Newcastle. The finest effort amongst them, without question, was that of the small "R" class 4-4-0 on the 5.15 p.m. southbound Leeds express. For a "Z" class "Atlantic"

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L. AND N.E. (NORTH EASTERN) RAILWAY. EDINBURGH—NEWCASTLE.

Distance.	Engine No. : / Engine Class : / Load (axles) / „ (tons tare) : / „ (tons full) :	Schedule.	592 R. 28 208 220	295 V. 32 233 245	719 Z. 34 231 245	728 Z. 34 237 250	Schedule.	2205 Z. 44 324 340	701 V. 48 345 360	Schedule.	703 V. 32 224 235	Schedule.	733 Z. 50 345 360	878 NB. 327 345
Miles.		Min.	M. S.	M. S.	M. S.	M. S.	Min.	M. S.	M. S.	Min.	M. S.	Min.	M. S.	M. S.
0·0	Edinburgh	0	0 00	0 00	0 00	0 00	0	0 00	0 00	0	0 00 p.w.r.	0	0 00	0 00
3·0	Portobello..	6	4 40	4 45	5 25	5 15	6	5 50	5 50	6	5 40	6	5 35	4 55
6·5	Inveresk	11	8 25	9 05 sigs.	9 55	10 00	11	10 25	10 30	11	10 40	11	9 50	8 30
13·3	Longniddry	19	15 10	17 20	17 20	17 40	19	17 55	18 30	19	18 25	19	17 40	15 05
17·8	Drem	pass	pass	pass	pass	pass	pass	pass	pass	¶	24 05	¶	23 25	pass
		24	19 45	24 00	22 15	22 15	24	22 30	23 30	24	24 50	24	24 00	19 35
23·5	East Linton	—	25 10	30 10	28 05	28 05	—	28 20	29 25	—	32 35	—	32 40	24 50
29·3	Dunbar	pass	pass	pass	pass	pass	pass	pass	pass		sigs.	39	39 25	†31 30
		36	30 30	36 00	33 35	33 45	36	34 05	35 15	39	38 30	0	0 00	0 00
36·5	Cockburnspath	—	38 55	44 20	42 20	42 10	—	42 30	43 55	—	48 25	—	12 00	11 35
41·3	Grant's House	52	48 15	52 35	51 05	50 00	53	52 35	54 20	58	57 20	22	20 50 p.w.r.	21 00
46·3	Reston Junction	58	53 35	58 20	56 35	55 25	59	58 30	59 55	64	63 15	28	27 20	26 45
52·0	Burnmouth	—	60 00	64 10	62 25 p.w.r.	60 50	—	64 35	65 35	—	70 40	—	33 30	32 15
57·5	Berwick	72	67 20	70 55	71 20	67 25	72	71 45	72 35	78	78 30	40	39 40	39 10
1·2	Tweedmouth	—	3 15 sigs.	3 00	3 05	3 05	—	3 00	3 15	—	2 50	—	42 15	41 35
8·3	Beal	—	14 15	10 50	11 00	10 40	—	10 40	11 15	—	10 10	—	49 40	48 55
15·3	Belford	18	21 35	18 35	18 30	18 40	19	18 10	19 05	18	17 10	58	57 10	56 20
20·9	Chathill	—	27 10	24 40	24 30	25 05	—	24 20	25 20	—	23 10	—	63 35	62 15
27·5	Little Mill	—	34 05	32 40	32 00	32 50	—	31 50	33 05	—	30 40	—	71 50 p.w.r.	69 40
32·1	Alnmouth Jc.	39	38 20	*37 40 sigs.	*36 30	*37 10	40	*36 25	*37 55	39	35 10	79	76 40	74 20
38·4	Acklington	—	45 00	49 05	43 20	44 40	—	43 25	45 20	—	42 00	—	84 40	81 20
43·7	Widdrington	—	50 30 p.w.r.	54 50 p.w.r.	49 00 p.w.r.	50 30 p.w.r.	—	49 15 p.w.r.	51 35 p.w.r.	—	47 45 p.w.r.	—	90 30 p.w.r.	87 15 p.w.r.
50·3	Morpeth§	60	58 35	63 45	58 45	59 40	62	59 30	62 00	60	57 50	101	99 35	96 20
56·4	Plessey	—	65 20	70 50	66 35	66 30	—	67 55	69 15	—	64 55	—	106 35	103 10
62·0	Killingworth	—	71 10	76 35	72 50	72 40 sigs.	—	74 10	75 40	—	69 45 p.w.r.	—	112 50	110 50

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67 m.p.h. at Dunbar, but fell to 21½ m.p.h. on the ascent to Grant's House, and lost ½-min. to Berwick. Continuing, we touched 65 m.p.h. at Goswick, and fell to 47½ before Belford and 41 on Christon Bank, although even so we managed to have over 2 min. in hand at Alnmouth, on the easy booking, to compensate for the slacks ahead; consequently we just kept time. On the 1.22 p.m., No. 703 of the same type put up some quite smart performance, the conditional stop at Drem being called, as well as a severe slack being entailed by a passage through the platform roads at Dunbar, for no reason that was apparent. However, a very adequate allowance is made of 78 min. to Berwick, to cover the possibility of both stops, and so light a load occasions no difficulty, even if both are made. I was unable to take any maxima or minima on this run, owing to my chronograph being out of order, but it will be noticed that we made the best times of the series from Berwick to Belford, where No. 592 commenced so systematic a "chase" as to be only 25 sec. behind at Plessey.

Both of the last two runs were excellent. No. 733, on the late 1.40 p.m. up, at the time when that train had conditional stops at both Drem and Dunbar, was stopped at each place. After Dunbar there ensued an exceptionally fine climb to Grant's House; in addition to the bank itself, the first 1¾ miles out of Dunbar are at 1 in 200, so that the proposition is a formidable one with a train of 360 tons. But we attained 50 m.p.h. on the short level past Innerwick, and went up the 1 in 96 at a lowest rate of 26 m.p.h., thus gaining over a minute to the summit. After Berwick we touched 71½ m.p.h. at Goswick, and fell to 49½ at Belford; 60 was attained again at Chathill, but I forgot to note the minimum on Christon Bank. Despite the Alnmouth check, time was well in hand at this point, and there was no need for further hurry.

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Henry L. Salmon.*

Aberdeen-Glasgow train near Stanley Junction. Caledonian 4-4-0 locomotive No. 84.

The last run, which was timed by a Newcastle friend, is of very great interest as "featuring" one of the superheated North British Railway "Atlantics," which regularly worked during May and June the 10.50 p.m. Aberdeen "sleeper" down to Newcastle. Unfortunately this log gives no details of maximum and minimum speeds, but the exceedingly smart time out to Dunbar, with its start-to-stop average of 55·8 m.p.h. and its gain of 4½ min. on booked time, cannot fail to be noted. Had the train been passing Dunbar at speed, it would have done so but very little over

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"even time" from Edinburgh. Then came a good climb of Cockburnspath Bank, and a leisurely descent to Berwick, which from Dunbar, stop included—at about the crucial point in the whole journey—was passed in less total time than the 72 min. then allowed the non-stopping trains. Further fast running followed to Alnmouth Junction, where the train was over 4½ min. inside schedule—making over 9 min. gain to engine from Edinburgh—but the running was then eased considerably. The fine capabilities of the North British "Atlantics" were, however, well demonstrated on this run. My friend tells me that adjacent, and p.w.r checks at Alnmouth Junction and East Linton. By contrast a run with No. 718 of the same type on a heavier 36-axle train of 280 tons was a fine exhibition. We breasted the rise to Killingworth in 10½ min., maintaining 43½ m.p.h. on the long 1 in 200, attained 66 m.p.h. on Plessey "dip," passing that station in 16 min. 40 sec., and were through Morpeth, at considerably reduced speed, in 22 min. from the start. We had accelerated to 62½ m.p.h. at Longhirst, when there came the Widdrington caution, so that we took 30 min. 50 sec. to Widdrington, and 36 min. 25 sec. to Acklington. Along here we were

Photo.] SOUTHERN RAILWAY. [*F. E. Headright.*

Waterloo–West of England Express near Surbiton. London and South Western rebuilt four-cylinder 4–6–0 locomotive No. 458.

Driver Henderson, who was responsible, scorned the 6-min. extra allowance when the Dunbar stop was made, and night after night made his exit from Edinburgh in this lightning fashion!

In the opposite direction, performance on what was, at the time of writing, the fastest train of the day—the 11.18 a.m. ex-Newcastle—with no more than pre-war load, and 9 min. extra running time, is generally devoid of special merit. Yet on one occasion the driver of No. 2401, at that time on "Z" No. 722, with only 220 tons, contrived to lose 6 min. to Edinburgh, with a p.w.r. check at Cramlington and a signal stop of ½-min. at Plessey, closely doing notably, with a sustained speed of 64½ to 69 m.p.h. all the way from Amble Junction to Alnmouth, where we were again badly checked for p.w. relaying. Nevertheless we worked up to 41½ m.p.h. on the 1 in 170 of Longhoughton bank, and then followed some fast travelling, with maxima of 72½ m.p.h. on Christon Bank, and 75 before Beal; in fact, speed did not go below 62½ m.p.h. for 20 miles, and we covered the 17·8 miles from Christon Bank to Goswick in 15 min. 40 sec. Alnmouth was passed in 41 min. 55 sec., Little Mill in 48 min. 50 sec., Chathill in 55 min. 10 sec., Belford in 60 min. 20 sec., Beal in 66 min. 20 sec., and Tweedmouth in 73 min. 40

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sec., speed having fallen to a minimum of 49 m.p.h. on the 1 in 190 of Scremerston Bank. So we got through Berwick, 67·9 miles, in 75 min. 25 sec., or 74 min. net, which would be equivalent in pre-war figures (without the Widdrington slack), to rather under 72 min. net.

Ascending out of Berwick, where the usual dead slow speed reduction was made, we got up to 37½ m.p.h. on the 1 in 190, taking 9 min. 55 sec. from Berwick to Burnmouth, 6¼ min. on to Reston Junction, and 6¾ min. thence to Grant's House, with a sustained rate of 42½ m.p.h. on the 1 in 200. The descent of Cockburnspath Bank was taken very cautiously, as usual, only 2 min. deducted from its schedule north of Newcastle in the summer accelerations, so that the series of night trains, with 144 min. allowed for the 124·4 miles' journey, will now better by a minute what has been for many years the fastest train of the day, and similarly between York and Newcastle, as previously mentioned, they will undercut the 92-min. allowance of this train by a matter of 2 min.

The two North Eastern " Pacifics " also work over this road. My friend notes that on the 11.18 a.m. out of Newcastle, No. 2401, with the normal load of 220 tons, only fell from 60 to 52·2 m.p.h. in the ascent of Longhoughton Bank (4 miles at

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*H. Gordon Tidey.*

Coke train passing Tebay water troughs. Furness 0–6–0 locomotive No. 32.

speed not exceeding 67 m.p.h. at any point, the time for the 12 miles from Grant's House to Dunbar being 11 min. 55 sec.; thence we ran on to Drem in 11 min. 20 sec., from there to Longniddry in 4 min. 40 sec., and from Longniddry to Inveresk in 6½ min., being now some 4¼ min. ahead of time. This involved us in signal delays, so that we arrived at Waverley only ½-min. ahead of time, in 146½ min. from Newcastle. But the final delays had cost us fully 5 min., leaving our net time 140 min. at most, and without the Widdrington check we might have improved on the pre-war 138-min. allowance with this fairly substantial train. This express has

1 in 170), and also attained 45 from the dead slowing at Berwick up the 1 in 190 to Burnmouth. Then, in the opposite direction, with the same load on the 5.15 p.m. express out of Edinburgh—the normal return working for the engine off the 11.18 a.m. down—No. 2401, by special request, was allowed to run the 12 miles from Dunbar up to Grant's House in 14 min., the successive miles of the 1 in 96 being run at 53·7, 46·9, 40·5, and 35·3 m.p.h. average respectively. From Cockburnspath to Grant's House the time was 6 min. 50 sec., or a minute exactly less than that of No. 728, the fastest in my table.

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The Harrogate Pullman Car Train.

INTRODUCTION OF ALL-PULLMAN TRAINS BETWEEN LONDON AND LEEDS (NON-STOP FROM AND TO KING'S CROSS) HARROGATE, RIPON, DARLINGTON, AND NEWCASTLE.

HAD it been suggested less than 20 years ago that Pullman cars, either included individually with ordinary stock, or made up as complete trains, would ever become general on British railways, such a view would have been regarded as distinctly improbable, if not as entirely out of accord with British railway policy. Indeed, of the four or five railways which had, at one time or another, operated Pullman cars, only one, the "Brighton," had consistently maintained its associations with the Pullman Car Company.

Yet, during the intervening years, first one and then another company has introduced Pullman cars of various designs, the Caledonian with first-class ordinary and observation Pullman cars operated under supplement conditions, and non-supplement first- and third-class Pullman restaurant cars (these were later run through to the Highland line) in place of railway restaurant cars; the South Eastern & Chatham with large numbers of first-class cars, employed largely on the Continental services, but more recently also on various Kent Coast routes; the Great Eastern with first- and third-class cars on many services (second- on the Continental trains); and the Metropolitan with two first-class vehicles; while the "Brighton" has added first- and third-class (second-class on Continental trains) on a generous basis. Moreover, the London, Brighton & South Coast, South Eastern & Chatham and Great Eastern Railways have introduced complete Pullman trains, while these lines, together with the Caledonian, have operated all-Pullman trains on special occasions, such as race-meetings, important football matches, etc.

And now we have to record, in amplification of our preliminary announcement last month and earlier anticipatory references, the introduction of all-Pullman trains by one of the new grouped companies, the London & North Eastern, operating over a route involving the interests of two of the component companies neither of which, previously, had adopted the Pullman car. Undoubtedly, a principal factor in the success of, and recent developments in, Pullman car practice is the provision for both classes. For first-class passengers, there can only be a limited field, though on popular routes the numbers travelling may be more than sufficient to justify the service, since the reduction in the first-class mileage rate has produced steadily increasing first-class traffic, and beyond the ordinary fares the Pullman supplement is a comparatively small matter. But in catering for the third-class passenger a much larger section of the travelling public is drawn upon. In either case, however, the rapid and notable extension of the Pullman car as a feature in British railway operation shows distinctly that there is a large public ready to pay reasonable, though relatively small, supplementary charges for superior accommodation.

The new service was originally intended only to serve Harrogate, the well known Yorkshire Spa, to and from which there is always a large volume of travel, this applying more or less all the year round, though it naturally becomes heaviest during the summer months and at holiday periods. The neighbouring spa of Ripon was then considered, and eventually it was decided to serve both places in each direction, the trains running through between London and Newcastle, so as to centre upon Ripon and Harrogate from the north as well as from the south, while passengers between London, Leeds, Darlington and Newcastle have the benefit of the service incidentally. The train is given a non-stop schedule between King's Cross and Leeds the 185¾ miles being covered in 205 minutes. The following tables, showing the principal passing and other times, will be of interest in this connection :—

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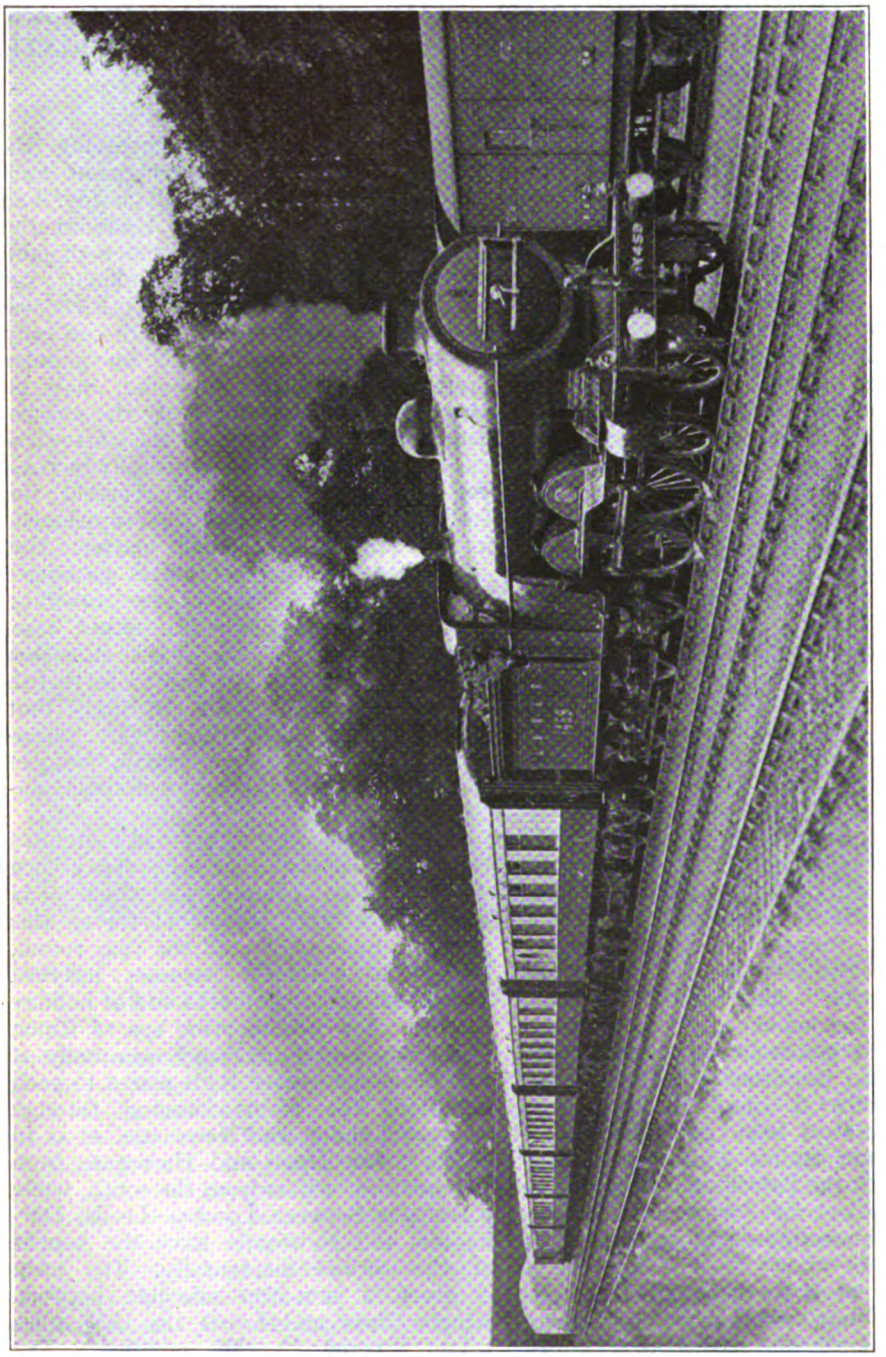

DOWN "HARROGATE" PULLMAN LIMITED EXPRESS, PASSING HADLEY WOOD. [*F. E. Mackay.*
Great Northern 4–4–2 locomotive, No. 1459.

Photo.]

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DOWN JOURNEY.

From King's Cross. M.	C.			Speed m.p.h.
—	—	KING'S CROSS ..	*dep.* 11.15	
				46·3
17	54½	Hatfield ..	*pass* 11.38	
				61·0
31	73½	Hitchin ..	*pass* 11.52	
				64·6
58	69½	Huntingdon	*pass* 12.17	
				58·3
76	29	Peterborough	*pass* 12.35	
				52·1
105	36½	Grantham ..	*pass* 1.8	
				58·6
120	8½	Newark ..	*pass* 1.23	
				58·4
138	49½	Retford ..	*pass* 1.42	
				52·0
155	77	Doncaster ..	*pass* 2.2	
				54·1
175	64½	Wakefield(Westgate)	*pass* 2.24	
				37·3
185	57	LEEDS (CENTR'L)	*arr.* 2.40	
		,, ,,	*dep.* 2.45	
				36·0
203	58	HARROGATE	*arr.* 3.15	
		,,	*dep.* 3.20	
				45·8
215	15	RIPON ..	*dep.* 3.35	
				47·9
243	12	DARLINGTON	*arr.* 4.10	
		,,	*dep.* 4.13	
				45·9
279	13	NEWCASTLE	*arr.* 5.0	

UP JOURNEY.

From Newcastle. M.	C.			Speed m.p.h.
			a.m.	
—	—	NEWCASTLE ..*dep.*	9.20	
				42·3
		DARLINGTON ..*arr.*	10.11	
36	1	,, ...*dep.*	10.14	
				50·8
63	78	RIPON .. ..*dep.*	10.47	
				32·6
75	35	HARROGATE ..*arr.*	11.8	
		,, ..*dep.*	11.15	
				36·0
93	36	LEEDS (Central) ..*arr.*	11.45	
		,, ...*dep.*	11.50	
				34·9
103	28½	Wakefield(Westgate)	*pass* 12.7	
				51·7
123	76	Doncaster ..	*pass* 12.30	
				57·7
140	43½	Retford ..	*pass* 12.48	
				55·5
159	4½	Newark ..	*pass* 1.8	
				54·9
173	56½	Grantham ..	*pass* 1.24	
				58·1
202	64	Peterborough	*pass* 1.54	
				55·2
220	23½	Huntingdon	*pass* 2.13	
				59·9
247	19½	Hitchin ..	*pass* 2.40	
				56·9
261	38½	Hatfield ..	*pass* 2.55	
				53·0
279	13	KING'S CROSS	*arr.* 3.15	

Average Speed.	Excluding Stops.	Including Stops.
London to Leeds ..	54·3	54·3
London to Harrogate ..	52·0	50·9
London to Newcastle ..	50·4	48·5

Average Speed.	Excluding Stops.	Including Stops.
Newcastle to London ..	49·2	47·1
Harrogate to London ..	52·0	50·9
Leeds to London ..	54·3	54·3

The Pullman supplements for principal stages are: between King's Cross and Leeds, Harrogate or Ripon, 7s. 6d. first-class and 4s. third-class. To Darlington the charges are 9s. and 5s., and to Newcastle, 10s. and 6s., respectively.

Passengers are not conveyed locally between Ripon, Harrogate and Leeds. The supplements from Newcastle to Harrogate are 2s. first-class and 1s. third-class. Seats to and from London can be reserved in advance The supplementary fees between Newcastle and Leeds are payable on the train.

The two trains, estimated to have cost about £70,000, each consist of six Pullman cars, four third-class and two first-class, all finished in the Pullman standard colours, amber and cream, relieved with scroll lines and gold decoration. In one train each of the six cars has a kitchen section, so placed that in each pair the kitchen sections adjoin. There is a slight difference in the sister train, in that one of the first-class Pullmans, the *Rosemary*, is a parlour car. This car has no kitchen but seats 26 passengers as compared with 22 in the buffet cars, while there is an

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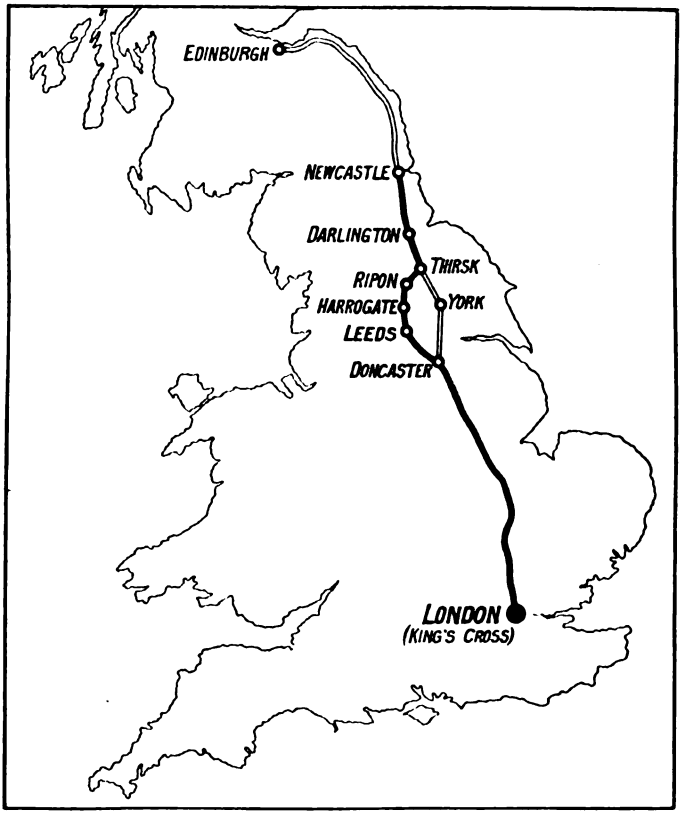
additional lavatory. The names of the other first-class buffet cars are *Fortuna, Iolanthe* and *Irene.* In accordance with general Pullman practice, the third-class cars are numbered, and cars 54 and 55 have each a seating capacity for 39 passengers, whilst cars 48, 49, 50, 51, 52 and 53 have each a seating capacity for 33 passengers.

The eight third-class cars were built by Clayton Wagons, Limited, of Lincoln, to the specifications of the Pullman Car Company, Limited. Six of these cars are equipped with six-wheeled bogies of the side equalising type with underframes and bodies of timber. The remaining two cars have four-wheeled bogies and steel underframes of a design recently developed by Clayton Wagons, Limited. This type of four-wheeled bogie is also employed for new cars recently supplied for service on the Caledonian section of the London Midland & Scottish Railway.



Sketch Map showing Route followed by "Harrogate" Pullman Limited Trains between London and Newcastle, compared with the usual Route via York for East Coast Trains.

General dimensions of the third-class cars are :—

Length over vestibule connections	65 ft. 4 in.
Length over vestibules	63 ft. 10 in.
Bogie centres—	
Six wheeled bogie cars	41 ft.
Four wheeled bogie cars	43 ft. 4 in.
Bogie wheelbase—	
Six wheeled bogie car	12 ft.
Four wheeled bogie car	10 ft.
Width over mouldings	8ft. 7 in.
Buffer height	3 ft. 6 in.
Height from rail to roof	12 ft. 5 in.
Seating accommodation—	
Six wheeled bogie cars	33
Four wheeled bogie cars	39

Each car contains two saloons with a lavatory, kitchen, and a pantry.

The four first-class cars are also fitted with the new four-wheeled bogies and were built by the Midland Railway Carriage & Wagon Company, Limited, Washwood Heath, Birmingham, in the remarkably short time of 12 weeks.

Principal dimensions are :—

Total length over buffers	65 ft. 10 in.
Length over vestibules	63 ft. 10 in.
Length over body ends	57 ft. 1½ in.
Length inside large saloon	17 ft. 9 in.
Length inside small saloon	13 ft. 6 in.
Length over underframe headstocks	62 ft. 4 in.
Centres of bogies	43 ft. 4 in.
Wheelbase of bogies	10 ft.
Height from rail to top of roof	12 ft. 5 in.
Width over cornice	8 ft. 7 in.
Width over outside mouldings	8 ft. 6 in.
Width inside compartments	7 ft. 9½ in.
Wheels	3 ft. 6 in. diam. on tread.
Axle journals	10 by 5 in. diam.
Tare weight complete on rail	42 tons 5 cwt.
Seating capacity	22 passengers.

Large saloon, 10 passengers; small saloon, 8 passengers; private compartment, 4 passengers.

The interior decoration of the cars may be briefly described as follows :—

Third-class cars.—Panelling of figured

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mahogany with centre panels of pommele mahogany or Hungarian ash, relieved by distinctive and varied decorative inlay of boxwood. Seats arranged three abreast, two on one side of the centre gangway and one on the other. Upholstery is of athol-leather, dark red in colour in five of the cars, and dark green in three cars.

First-class buffet-car "Fortuna."—22 passengers. Decoration in the Georgian style, panelling formed of a background of rich mahogany with "scale" pattern satine panels, with pilasters and friezes of white sycamore inlaid with green wood. Chairs are upholstered in red velour, and the carpet is of a deep rich red velvet pile.

First-class Buffet Car "Iolanthe."—22 passengers. Decoration of "Treillage" form. The woods used are pear tree ground with mahogany trellis and bandings, with a floral treatment running through the trellis of vines. Chairs are upholstered in blue velour, and the carpet is of a deep blue velvet pile.

First-class Buffet Car "Irene."—22 passengers. Decoration shows an arcade effect by placing pilasters and arches of a light wood on a rare and richly figured mahogany back-ground. Pilasters and arches have a sycamore ground with trellis banding of green, and growing through this there are branches of "Pyrus Japonica" executed in inlaid woods in natural colours. Chairs are upholstered in green leather and the carpet is of a rich green velvet pile.

First-class Parlour Car "Rosemary."—26 passengers. Decoration is "Renaissance" in character, and the woods used are mahogany with finely "mottled" panels with circle tops having finely inlaid panels and arched tops of pear tree. Chairs are upholstered in red velour and the carpet is of a deep red velvet pile.

Luggage racks, wall brackets, table lamps and other accessories are in harmony throughout all the cars. Lavatory compartments are finished in polished mahogany throughout, the floors being covered with decolite. The pedestal wash basin is provided with both hot and cold water supply, Westinghouse heaters encased in mahogany being fitted immediately above the wash basin, the fittings being finished in nickel silver. Kitchens and pantries at the service end of the buffet cars are equipped with the usual furnishings, consisting of sinks with hot and cold water supply, glass cupboards, drawers, gas-heated ranges, &c. The water supply is carried in copper tanks above the kitchen ceiling, and a large galvanised steel bin is provided beneath the kitchen floor to give extra storage accommodation. Ice chests are provided in the corridors. Other details of the equipment include: dual brakes, automatic couplers and adjustable buffers of Pullman standard to suit operation with East Coast joint stock, dwarf torpedo ventilators fixed on rods, and pull-down fittings on interior ceilings, steam heating pipes and fittings of Pullman standard, lighting on Stone's system.

On Saturday and Sunday, June 30 and July 1, at the invitation of the London & North Eastern Railway Company, the Pullman Car Company, and the Mayor and Corporation of Harrogate, a large party, composed of members of the medical profession, railway officers and press representatives, made a trip to Harrogate and back by one of the new trains. On this occasion the train was made up of four first-class Pullmans and two third-class, but it observed the normal timings from London to Harrogate on the downward journey. Luncheon was served on the downward journey. The return journey was made on the Sunday afternoon, leaving Harrogate at 3 p.m., arriving at King's Cross at 6.55 p.m. During the stay at Harrogate the visitors were given ample opportunities of acquainting themselves with the various attractions of this famous spa, whilst on Sunday morning was arranged a special inspection of the Royal baths.

Among various representatives of railway interests were: Mr. C. C. Champeney; Mr. Kenneth Foster; Major Ralph Glyn. The London & North Eastern Railway Company was represented by Mr. R. L. Wedgwood, Chief General Manager; Mr. S. A. Parnwell, Divisional General Manager (Southern Area); Mr. Alex. Wilson, Divisional General Manager (North-Eastern Area); Mr. H. N. Gresley, Chief Mechanical Engineer; Mr. C. L. Edwards, Chief Accountant; Mr. W. M. Teasdale, Advertising Manager; Mr. H. A. Watson, General Superintendent (North-Eastern Area); Mr. C. J. Selway, Passenger

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Manager (Southern Area); Mr. R. Rowland, Assistant Passenger Manager (North-Eastern Area); Mr. P. A. Harverson, Assistant Passenger Manager (North-Eastern Area); Mr. J. H. Smeddle, Running Superintendent (North-Eastern Area); Mr. J. F. Wintour, Assistant Mechanical Engineer (Southern Area); Mr. O. Bulleid, Assistant to Chief Mechanical Engineer; Mr. T. Smith, Assistant Superintendent (Southern Area). The Pullman Car Company, Ltd., were represented by Sir Davison Dalziel, Bart., M.P.; Mr. Thomas Powell; Mr. W. J. Sedcole; Mr. George F. Milne.

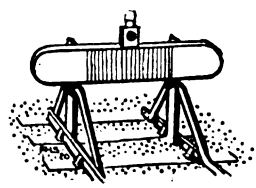
On the Saturday evening the visitors were entertained to dinner by the Mayor and Corporation at the Majestic Hotel, the party being augmented by a number of representative citizens of Harrogate. Mr. R. L. Wedgwood, Chief General Manager, London & North Eastern Railway, in proposing "The Town of Harrogate," said that, thanks to the energy and public spirit of its citizens and Corporation, it could claim almost without fear of challenge, the right to be called the premier health resort of Great Britain. The London & North Eastern Railway Company, which had the privilege of serving Harrogate, was no less alive to the importance and value of its traffic. Consequently when the Harrogate Corporation came forward with their proposal for a Pullman train service which should combine the last thing in luxury with the best thing in speed, they found the railway in responsive mood, and so it came about that they met there that night to wish this experiment every success. Alderman J. Sheffield, Deputy Mayor of Harrogate, relied on behalf of the Corporation.

Sir A. Ernest Bain, K.B.E., Chairman of the Wells and Baths and Publicity Committee of Harrogate, proposed the toast of "Our Guests," coupling with it the names of Sir Davison Dalziel, representatives of the medical profession and the press.

Sir Davison Dalziel, Chairman of the Pullman Car Company, in replying, said that he had heard with much gratification that it was recognised by the Corporation of Harrogate that the new service must be regarded as a business proposition. The new train was a costly enterprise and required good support. He said little of the enterprise of the Pullman Company in providing the train, pointing out that without the co-operation of the London & North Eastern Railway Company they could have done nothing, but for their part they would leave no stone unturned to make the service a success.

Dr. R. Fortescue Fox, replied on behalf of the medical profession.

Mr. J. A. Kay, Editor of the *Railway Gazette*, in replying on behalf of the Press representatives, said that the London & North Eastern Railway Company and the Pullman Car Company, in providing Harrogate with the luxurious new train they had travelled down in that day, had paid that go-ahead resort a genuine compliment.



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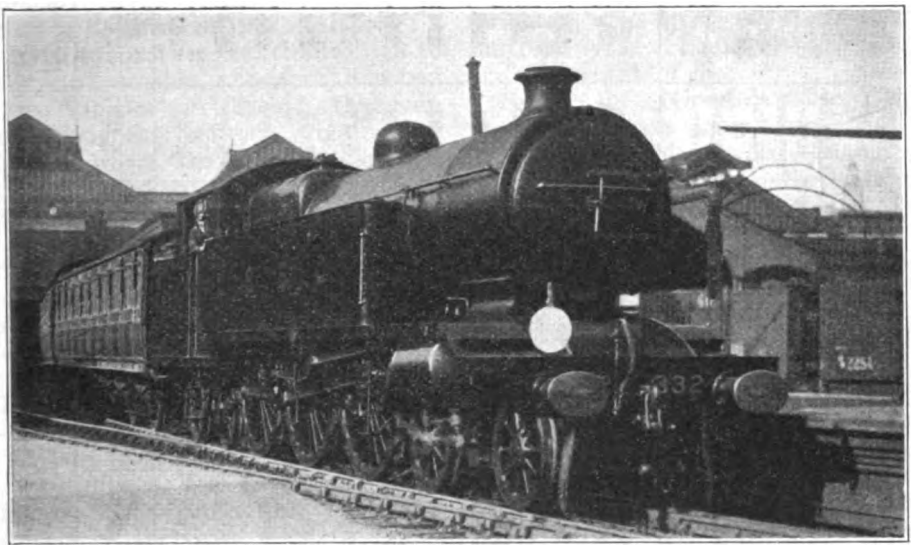

Photo.] SOUTHERN RAILWAY. [*F. E. Mackay.*

5.35 p.m. Brighton Express leaving Victoria. 4-6-4 tank engine, No. 332.

The "Brighton" Main Line, 1898 to 1922: A Retrospect. [No. II.]

By MAJOR H. MYERS.

(*Continued from page* 44, *July Number.*)

IN the first instalment of this article the author dealt with "Brighton" main line services during the closing years of the 19th and the early years of the 20th century, considering facilities, train running, and the work of the Stroudley and Billinton engines. A table of fastest times recorded by the writer when travelling behind various classes of engines, including modern as well as older designs, between Victoria and Brighton, was also given.

During the benighted era hitherto referred to, Brighton and the other Sussex watering-places might, in their inaccessibility from the North and Midlands, almost have been on another island. Seasickness was about the only weariness of the flesh that did not beset the venturesome holiday-maker who braved the voyage of discovery from Manchester or Birmingham to the Sussex coast. He had to tranship his family, his baggage and himself twice—from train to cab and vice versa—in order to cross London, and to see each trunk, box and portmanteau labelled afresh at Victoria and London Bridge. Moreover, the campaign against excess luggage was fought at those stations with extraordinary zeal and determination, so that highly entertaining comedies were staged daily in which the principals were a heated traveller with five minutes to catch his train, and a polite but adamantine official insisting on excess payment in respect of *X* pounds *Y* ounces of baggage. Through coaches might run from "the provinces" to Bournemouth, Torquay, Cromer and so forth, but what of that? Brighton metals remained sacrosanct from the polluting touch of the foreign tyre.

This "splendid isolation" at length gave way when through carriages from the

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Class of locomotive.	Number of engines in class	Number of engines recorded.	Number of runs.	Total distance.	Total booked time.	Total actual time.	Total net time.	Average speeds.			Cases of time lost by locomotive.	Gain by locomotives per cent. of booked time.	Average load.
								Booked.	Actual.	Net.			
				miles.	mins.	mins.	mins.	m.p.h.	m.p.h.	m.p.h.			tons.
0-4-2 (" Gladstone ") ..	36	34	196	6,319	8,580	8,549	8,163	44·2	44·4	46·4	16	4·86	237
4-4-0, small	25	10	17	520	713	702	667	43·8	44·4	46·8	1	6·45	221
4-4-0, small, rebuilt ..	25	20	84	2,970	3,843	3,861	3,706	46·4	46·2	48·1	15	3·56	232
4-4-0, large	33	33	330	10,815	14,337	14,292	13,641	45·1	45·4	47·6	27	4·85	263
4-4-2/T, 6 ft. 7 in., non-superheater.	7	7	41	1,248	1,603	1,602	1,549	46·7	46·7	48·3	10	3·37	234
4-4-2/T, 6 ft. 7 in., superheater.	20	18	105	3,737	4,706	4,601	4,429	47·6	48·7	50·6	4	5·89	239
4-4-2, non-superheater ..	5	5	129	5,435	6,778	6,732	6,429	48·1	48·9	50·7	1	5·15	247
4-4-2, superheater ..	6	6	74	3,140	3,817	3,778	3,582	49·4	49·9	52·6	1	6·16	252
4-6-2/T	2	2	24	1,011	1,239	1,244	1,169	49·0	48·8	51·9	nil	5·65	265
4-6-4/T	7	7	21	1,038	1,222	1,265	1,160	51·0	49·2	53·7	nil	5·07	299
Other classes	—	—	28	467	682	657	635	41·1	42·6	44·1	1	6·89	161
Aggregates and averages ..	—	—	1,049	36,700	47,517	47,283	45,130	46·3	46·6	48·8	76	5·02	247

TABLE A.

SUMMARY OF ALL RUNS BETWEEN VICTORIA AND BRIGHTON, ANALYSED ON THE BASIS OF LOCOMOTIVE CLASSES.

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London and North Western Railway began running to Brighton in 1907. Although a new train was put on in each direction to convey these coaches, not more than two or three vehicles ran through, the main train working only between Brighton and Willesden, where the through carriages were transferred to and from existing London and North Western expresses. But the success of the new facilities was so marked that before long a complete through train became needed, and the "Sunny South Special" was born—with through carriages from Liverpool, Manchester and Birmingham to Eastbourne, via Brighton, and a restaurant car throughout—all London and North Western stock, and all daily filled to overflowing.

A very different fate awaited the effort made about the same time to attract passengers off the Great Western system by running a through train between Brighton and Paddington. From beginning to end, its brief career was a failure—proof positive that to the holiday traveller the attraction of a through carriage lies in the freedom from "changing," not in the mere saving either of cab fares or of journey time. It was indeed a vivid object lesson to stand at Brighton station from 5 to 5.20 p.m. and see the "Sunny South" arrive packed and the Paddington train follow 12 min. later with a meagre score or so of passengers.

Leaving aside these and a few other spasmodic kicks, the "Brighton's" long sleep lasted until Mr. Finlay Scott succeeded in 1909 to the Superintendency of the Line. And then the awakening was to some purpose! Beginning with the summer issue in June, 1909, the entire time-table was remodelled until, in about a year, hardly one important train was left unimproved: in fact it may be said that the present service was substantially complete by 1910, though modification in details was in constant progress down to the outbreak of the war.

To give any minute description of the radical changes in bookings is obviously impracticable, seeing that the alterations were counted by dozens. Suffice it to say that 60-min. trains became as plentiful as 70-min. ones had been, while as for 65-min. bookings, they were "of none account in King Solomon's time"—or rather in Mr. Scott's time-tables. The fastest booking, 56 min. from Clapham Junction to Brighton, went up by five miles an hour; and, save the "Southern Belle," every train carried third class.

Before the "Great Awakening," the stock of express locomotives had been augmented by Mr. D. Earle Marsh's five "Atlantics," Nos. 37–41, the first five of his celebrated 4-4-2 superheater tanks, Nos. 22–26, and some similar "saturators," Nos. 21 and 27–30. Additions were made to these classes of tank engines until finally there were (and are) 20 of the superheaters and seven "saturators," but the latter never approached "within shouting distance" of their superheated sisters, either for work or for economy. The "I 3's" indeed were a revelation, and superheating was instantly established as standard practice for all future express types. As the original "Atlantics" proved very successful in meeting the exacting requirements of the new time-tables, it was but natural that they should be followed by a superheated edition, which duly appeared to the number of six in 1911. Simultaneously a logical development in the express-tank evolution was evidenced by the construction of two very fine 4-6-2's, Nos. 325, *Abergavenny* and 326, *Bessborough*; and the latest—not necessarily the last—step in the same direction has been taken by Lieut.-Colonel Billinton in his seven superb 4-6-4 tanks of the *Charles C. Macrae* batch. It may be said once for all that, apart from the non-superheater tanks (which were quite respectable engines), all these various classes have been brilliantly successful, and that all are continually affording examples of first-rate locomotive work to anyone who takes the trouble of observing their performances.

At this point the reader will exclaim, "Oh, the man is infatuated with his blessed Brighton engines! What I want is evidence of the efficiency he talks about so confidently." Well, that is not unreasonable, so here are some statistics. Table A summarises the writer's records of all runs to date. This table requires a little explanation. In the first place, runs of less than 10 miles are excluded, they hardly constitute express duty, and in the case of the London, Brighton and South Coast Railway main-line the bookings over short distances are generally much easier

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TABLE B.—FASTEST TIMES WITH VARIOUS CLASSES OF ENGINES, BRIGHTON TO VICTORIA.

	Stroudley types.		4-4-0		$\frac{4\text{-}4\text{-}2}{T}$		4-4-2		$\frac{4\text{-}6\text{-}2}{T}$ and $\frac{4\text{-}6\text{-}4}{T}$		All classes.	
	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.	Point to point.	From start.
	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.	m. s.
Brighton .. .. .. start		0.00		0.00		0.00		0.00		0.00		0.00
	2.25		2.56		3.00		2.50		3.01		2.25	
Preston Park .. .. pass		2.25		2.56		3.00		2.50		3.01		2.25
	4.49		4.19		4.25		4.05		4.16		4.05	
Milepost 46.. .. .. ,,		7.14		7.15		7.25		6.55		7.17		6.30
	2.50		2.33		2.28		2.18		2.22		2.18	
Hassocks .. .. .. ,,		10.04		9.48		9.53		9.13		9.39		8.48
	2.39		2.24		2.22		2.06		2.27		2.06	
Keymer Junction .. .. ,,		12.43		12.12		12.15		11.19		12.06		10.54
	2.54		2.39		2.39		2.25		2.40		2.25	
Haywards Heath .. .. ,,		15.37		14.51		14.54		13.44		14.46		13.19
	4.26		3.51		3.35		3.31		3.45		3.31	
Balcombe .. .. .. ,,		20.03		18.42		18.29		17.15		18.31		16.50
	2.29		2.12		2.17		2.01		2.00		2.00	
Milepost 31¼ .. .. ,,		22.32		20.54		20.46		19.16		20.31		18.50
	2.32		2.13		2.21		2.12		2.14		2.12	
Three Bridges .. .. ,,		25.04		23.07		23.07		21.28		22.45		21.02
	3.09		2.59		2.51		2.49		2.50		2.49	
Horley .. .. .. ,,		28.13		26.06		25.58		24.17		25.35		23.51
	3.59		3.41		3.35		3.35		3.29		3.29	
Earlswood .. .. .. ,,		32.12		29.47		29.33		27.52		29.04		27.20
	3.39		3.13		3.06		3.11		3.03		3.03	
Quarry Box .. .. ,,		35.51		33.00		32.39		31.03		32.07		30.23
	1.40		1.29		1.29		1.29		1.26		1.26	
Milepost 17¼ .. .. ,,		37.31		34.29		34.08		32.32		33.33		31.49
	3.50		3.46		3.32		3.40		3.47		3.32	
Purley .. .. .. ,,		41.21		38.15		37.40		36.12		37.20		35.21
	1.48		1.39		1.43		1.42		1.51		1.39	
Croydon (South) .. .. ,,		43.09		39.54		39.23		37.54		39.11		37.00
	0.49		0.44		0.47		0.45		0.50		0.44	
Croydon (East) .. .. ,,		43.58		40.38		40.10		38.39		40.01		37.44
	1.27		1.02		1.11		1.11		1.24		1.02	
Selhurst .. .. .. ,,		45.25		41.40		41.21		39.50		41.25		38.46

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Thornton Heath ..	..	..	0.45	46.10	0.37	42.17	0.42	42.03	0.43	40.33	0.46	42.11	0.37	39.23
Norbury ..	..	..	1.17	47.27	1.03	43.20	1.09	43.12	1.10	41.43	1.13	43.24	1.03	40.26
Streatham Common	..	..	0.53	48.20	0.45	44.05	0.47	43.59	0.47	42.30	0.52	44.16	0.45	41.11
Balham ..	..	..	2.01	50.21	1.47	45.52	1.44	45.43	1.42	44.12	1.58	46.14	1.42	42.53
Wandsworth Common	..	..	0.37	50.58	0.34	46.26	0.34	46.17	0.34	44.46	0.37	46.51	0.34	43.27
Clapham Junction..	..	..	1.21	52.19	1.13	47.39	1.16	47.33	1.12	45.58	1.24	48.15	1.12	44.39
Battersea Park ..	..	..	1.57	54.16	1.43	49.22	1.46	49.19	1.50	47.48	2.09	50.24	1.43	46.22
Grosvenor Road Box	..	..	0.47	55.03	0.43	50.05	0.46	50.05	0.50	48.38	0.53	51.17	0.43	47.05
Victoria ..	..	..	1.22	56.25	1.13	51.18	1.29	51.34	1.07	49.45	1.44	53.01	1.07	48.12
			stop											

than the longer ones, so that a somewhat fictitious gain would accrue to the engines were these very short "snippets" reckoned in. Secondly, a "run" is any start-to-stop stage of 10 or more miles; thus a train from London to Brighton, calling at East Croydon and Hayward's Heath, would provide three "runs," respectively 10·5, 27·5 and 12·9 miles long. This method is a little unfair when considering "time lost by engine," since each "run" is treated as independent of any other, and, consequently, a loss on any stage means a "black mark" even though the time were subsequently regained. The main point to note is that the system of compiling the table by no means favours the engines. A quarter of a minute or anything more is entered as a loss, and the delays are computed very closely—as is feasible with a quarter of a century's experience—and with rigid impartiality.

Bearing in mind all these points, the outcome of the 25 years' observations may fairly be called remarkable. Without challenging comparison with other lines, it cannot be usual that out of 1,000 and more runs there should be a mere 76 in which the engine failed to achieve what was demanded of it. Especially noteworthy is such a record when the average length of run is so short as 35 miles, for then there is but scant opportunity of regaining any initial loss of time due to accidental hindrances such as a greasy rail, slight shortness of steam, or a "sticking" brake.

The average amount of delay is shown by the difference between total actual and total net times. It works out at a shade over 2 min. per run. As an average, 2 min. in every 35 miles is a high figure for detentions, but it must not be taken as reflecting on the traffic management. Unless and until every train runs with precise punctuality—in other words, until the millennium—traffic of the density attained on the "Brighton" cannot be conducted without signal checks. But another cause accounts largely for the high average of delay, namely, the extensive widening works that were in progress during much of the period, and involved many and grievous permanent-way checks, affecting both up and down roads.

Far from being to blame for excessive delays, the "Brighton" traffic manage-

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TABLE C.—AVERAGE TIMES ON SIXTY-MINUTE RUNS BETWEEN VICTORIA AND BRIGHTON.

Up.			Stations.			Down.		
Booked times.	From start.	Point to point.				Point to point.	From start.	Booked times.
min.	m. s.	m. s.				m. s.	m. s.	min.
60	57.12		stop	Victoria	start		0.00	0
		1.39				2.13		
—	55.33		pass	Grosvenor Road Box ..	pass		2.13	—
		0.56				1.11		
—	54.37		,,	Battersea Park	,,		3.24	—
		2.03				2.09		
55	52.34		,,	Clapham Junction ..	,,		5.33	5
		1.22				1.50		
—	51.12		,,	Wandsworth Common ..	,,		7.23	—
		0.38				0.51		
—	50.34		,,	Balham	,,		8.14	—
		2.05				2.33		
—	48.29		,,	Streatham Common ..	,,		10.47	—
		0.53				1.00		
—	47.36		,,	Norbury	,,		11.47	—
		1.17				1.26		
—	46.19		,,	Thornton Heath	,,		13.13	—
		0.47				0.53		
—	45.32		,,	Selhurst	,,		14.06	—
		1.19				1.23		
45	44.13		,,	Croydon (East)	,,		15.29	15
		0.51				1.08		
—	43.22		,,	Croydon (South)	,,		16.37	—
						1.25		
—	—	1.54	,,	Purley Oaks	,,		18.02	—
						1.07		
—	41.28		,,	Purley	,,		19.09	—
						1.48		
—	—	3.53	,,	Coulsdon	,,		20.57	—
						3.16		
—	37.35		,,	Milepost 17¼	,,		24.13	—
		1.42				1.39		
36	35.53		,,	Quarry Box	,,		25.52	26
		3.34				2.56		
—	32.19		,,	Earlswood	,,		28.48	29
		3.59				3.46		
—	28.20		,,	Horley	,,		32.34	—
		3.05				3.27		
25	25.15		,,	Three Bridges	,,		36.01	37
		2.27				2.52		
—	22.48		,,	Milepost 31¾	,,		38.53	—
		2.27				2.10		
—	20.21		,,	Balcombe	,,		41.03	—
		4.11				3.32		
—	16.10		,,	Haywards Heath.. ..	,,		44.35	—
		2.49				2.46		
13	13.21		,,	Keymer Junction ..	,,		47.21	49
		2.31				2.32		
—	10.50		,,	Hassocks	,,		49.53	—
		2.37				2.46		
—	8.13		,,	Milepost 46	,,		52.39	—
		4.44				3.17		
—	3.29		,,	Preston Park	,,		55.56	—
		3.29				2.21		
0	0.00		start	Brighton	stop		58.17	60

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ment has shown itself consistently efficient and resourceful. Not only has the increase in the volume of traffic led to no greater delays, but the frequency of signal checks has actually diminished, so far at any rate as my own experience goes; and the conduct of shunting and marshalling operations at important centres has for long been of quite uncommon smartness. Some of the problems confronting the outdoor staff could not be solved otherwise. For example, the engine of the 3.50 p.m. from Victoria, due into Brighton at 5 p.m., was for some time scheduled to return on the 5.45 up express. This meant that the empty stock of the down train (also forming part of the up) had to be hauled out from the arrival platform and placed at another, the engine backed out to the turntable at Montpelier Junction (⅜ mile), turned, coaled and watered; additional coaches, meanwhile, coupled to the up train and the engine brought back. Concurrently, the "Sunny South" would come in from Willesden at 5.05 and be off again at 5.17 for Eastbourne; a semi-express for London would start at 5.05, a local to Haywards' Heath at 5.10, and the 4 p.m. from London Bridge would run in at 5.12, bringing through coaches for Worthing to be run out and shunted right across from east to west on to the Worthing train leaving at 5.22. Lastly, the empty residue and the engine of the 4 p.m. had to be disposed of, and two more trains accepted at 5.40 and 5.45, these being respectively a "local" and the 4.30 p.m. ex Victoria. Day after day this complex series of operations was carried out without hitch or excitement. At many places the staff would be well satisfied, and justifiably, if they got over such a nightmare of perpetual motion as an occasional emergency!

That the average amount of hindrance was not so great as to interfere with punctuality is proved by further reference to table A, which exhibits the fact that the total actual time occupied on all the journeys was slightly less than the aggregate booked time. As late starts were uncommon, it follows that most of the arrivals must have been punctual.

Before leaving table A it is worth mention that the rather large excess of actual overbooked time on the part of the 4-6-4 tanks is wholly attributable to a couple of journeys at holiday periods, resulting in late arrivals of 35 and 13 min. respectively.

Table C has been prepared to illustrate the manner in which the requirements of the 60-min. schedule are met in practice. It gives the average point-to-point time of all runs on the 60-min. timing or equivalent bookings for shorter distances: the sections on which the running was appreciably affected by checks are, of course, excluded. The averages are compiled from 113 down and 89 up journeys, and are thus fully representative of the work under all conditions. It will be seen that the bookings from both ends are harder on the first part of the journey than on the remainder; the average time from either Victoria or Brighton to Quarry is practically as booked, whereas the continuation of the journey results in average gains of 95 sec. (down) and 2 min. 41 sec. (up).

Table B, together with that given last month, cover the fastest point-to-point times recorded with the various classes of locomotives. The last column in each of these tables demonstrates the "possible" times obtained by summing the quickest intermediate records. Although these figures take no account of load, it is in fact only over the early stages in either direction that the shortest times have been afforded by really light trains, almost all the others are with 200 tons and more, and quite a good proportion were achieved with 300 tons or over. The "possible" run of 48 min. 12 sec. from Brighton to Victoria is a sufficiently startling one, and even in the other direction 49 min. 58 sec. is 10 min. under the best schedule, though it fails by 70 sec. to reach the "Record Run" of 1903.

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Locomotive and Train Working in the latter part of the 19th Century.

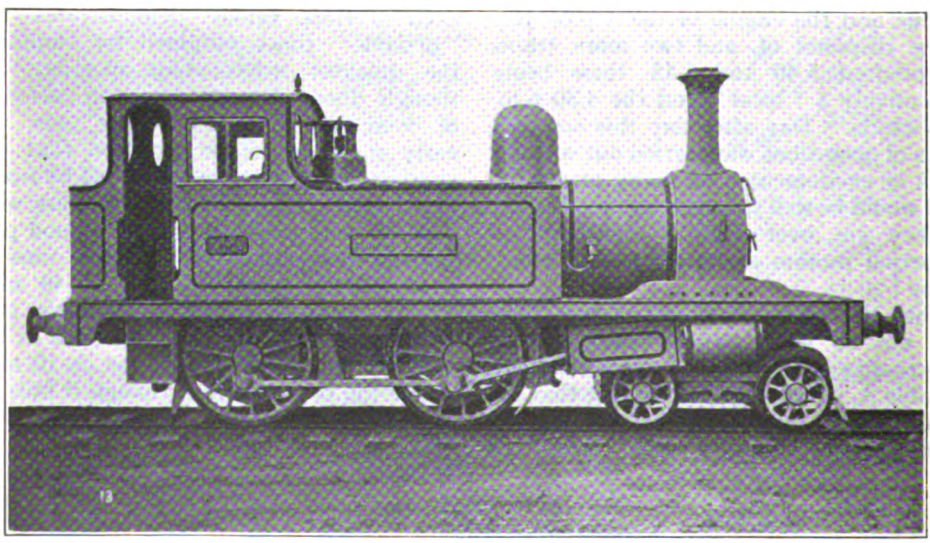
MIDLAND AND GREAT NORTHERN JOINT RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THE Eastern and Midlands Railway, which from 1889 to 1893 was taken over by the Midland and the Great Northern Railways, itself dates back only to January, 1883, when it was formed by the amalgamation of a number of small local railways in Norfolk, some of which apparently began in a field at the back of nowhere and ended in another field a long way from anywhere else. After the amalgamation of the various local railways, the line had a sort of distant and miniature resemblance to the American "Pennsylvania Railroad," in that there was a sharp line of demarcation between "Lines East" and "Lines West," the dividing line, corresponding to Pittsburgh, being the ancient but more classic borough of King's Lynn.

The "lines west," though owned by the Eastern and Midlands Company, were not worked by it, but were handed over to the tender and fostering care of the Midland and the Great Northern railways. These lines consisted of the Bourne and Lynn section, and the Peterborough, Wisbech and Sutton Bridge section, which joined the former at Sutton Bridge.

The Peterborough, Wisbech and Sutton Bridge line, which makes a junction with the Midland about 60 chains north of Peterborough station, was always worked by the latter company, whose trains went forward to Lynn. Two Midland 2-4-0 passenger engines of the 1070–1079 class and two or three double-framed goods engines were stationed at Lynn for this traffic.



4-4-0 TANK ENGINE (EASTERN & MIDLANDS RAILWAY) No. 4 "NORTH WALSHAM."
Built by Hudswell, Clarke & Co., Ltd., Leeds, 1878.
Coupled wheels, 4-ft. 7-in. diam. Cylinders, 14-in. and 15-in. by 20-in.

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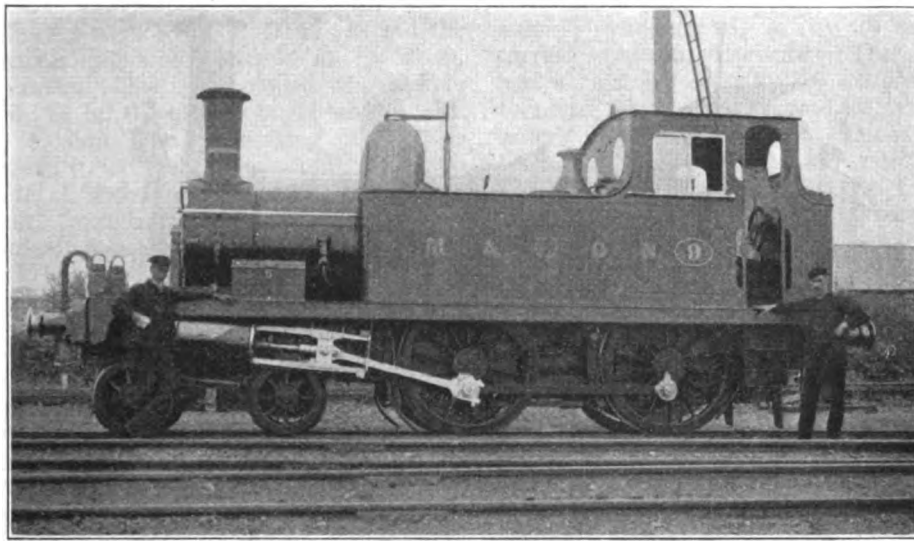

4-4-0 TANK ENGINE NO. 9.
As rebuilt at Melton Constable.

The Bourne and Lynn section formed a sort of joint railway worked by both the Great Northern and Midland companies, though between Sutton Bridge and Bourne practically all the trains were worked by the Great Northern, with the exception of one or two cattle trains per week destined for Leicester, which were worked by Midland goods engines to Bourne, and taken on thence to Essendine and Stamford by Great Northern engines. At Stamford they were again handed over to the Midland.

At no principal town had the Eastern and Midlands Railway its own station. Access to Lynn from the "lines west" was obtained over a branch from a point near the present station of South Lynn to the Great Eastern station at King's Lynn. At Peterborough the Midland platform provided the necessary accommodation, and both Bourne and Spalding were Great Northern stations. Access to Spalding was only possible by means of double V-reversing curves, and the present avoiding line was a product of much later date.

But all this, as far as the "lines west" were concerned, was a matter of hardly any consequence, for beyond lending its name as the owner of the lines, the Eastern and Midlands slept with the soundness of a sleeping partner as far as working was concerned, and woke up only when any money was due. In its latter days it certainly worked one train each way, a Cromer express, between Lynn and Peterborough during the summer season only, with its own engines, and this was about all that was seen of the old E. and M. on the lines west of Lynn.

Lynn itself was a natural obstacle similar to Spalding, and effectually cut off the "lines west" from the "lines east." The Midland and the Great Northern trains from Peterborough or Spalding came in via the Great Eastern line, Lynn being a terminal station. The Eastern and Midlands trains for the "east" lines departed from Lynn over the Great Eastern Hunstanton line, and then switched off in a south-easterly direction to Bawsey sidings, where they reached the present main line.

The Midland, in 1880, worked four stopping trains daily each way between Peterborough and Lynn, and the Great Northern worked a few "accommodation trains," to use an American expression, on the lines to Spalding and Bourne.

The lines east of Lynn were entirely in the hands of the owning company. The first portion consisted of the old Lynn and Fakenham Railway, which began at a junction with the Great Eastern Hunstanton line at Gaywood and then disappeared

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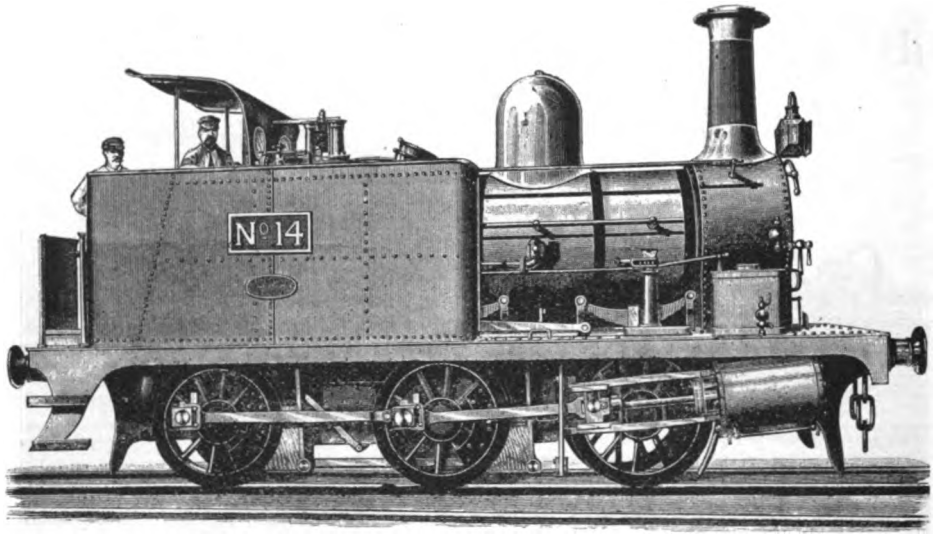

0-6-0 TANK ENGINE NO. 14.
Built, 1873–4, by Sharp, Stewart & Co., Ltd., for the Cornwall Minerals Railway.
Coupled wheels, 3-ft. 6-in. diam. Cylinders, 16½-in. by 20-in.
(Reproduced from "The Engineer.")

into the "back of beyond" in the county of Norfolk. Later on somebody discovered the tail of this line wagging amongst the poppy fields, miles from anywhere, and hitched a few pieces on to it, which eventually, in 1882, terminated at Norwich. These extensions ran from Fakenham through Melton Constable. If you search a Bradshaw of 1880 for Melton Constable you won't find much for your pains, for it was not there. Now it is the centre of the engineering activity of the Midland and Great Northern Joint Railway.

There was also another line which started from Yarmouth, and eventually called itself the Yarmouth and North Norfolk Railway. It made a bold push into the wilds of Norfolk, and then got lost somewhere in the vicinity of North Walsham. It was not until 1883, after the various small companies had amalgamated as the Eastern and Midlands, that the connecting line from North Walsham to Melton Constable was made. The Cromer branch from Melton Constable was finally completed in 1887.

Now that the subject of locomotives comes under consideration, the reader will begin to understand why the lines west of Lynn were worked by other companies. In 1883, at the date of amalgamation, there were only 26 engines, although the new Eastern and Midlands Company owned something like 140 miles of railway, nearly all of which was single line. A total of 26 engines does not go very far towards the provision of anything but an extremely "thin" train service. However, by keeping its own stock east of Lynn, the company made the best of matters.

But the locomotives themselves formed the quaintest assortment that ever adorned a railway of this length. There were a good many shapes, but only about one size, which fitted the railway after the manner of a 5⅞ hat on a 14-in. foot.

This collection had been gathered together through the united efforts of the directors and officials of the Lynn and Fakenham and the Yarmouth and North Norfolk Railways, who possibly bought some of them at a "jumble sale."

Exception must be made of four 4-4-0 fast passenger engines which started work on the Lynn and Fakenham Railway about 12 months before the amalgamated lines became the Eastern and Midlands Railway.

The passenger locomotive stock consisted of seven small 4-4-0 side-tank engines built by Hudswell, Clarke & Co., of Leeds, between 1878 and 1881. The outside

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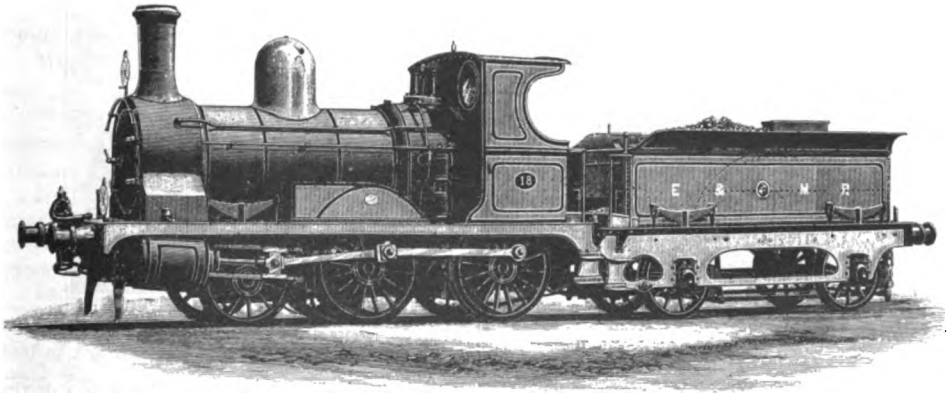
cylinders were 15 in. by 20 in., except the two earliest, which had 14 in. by 20 in. cylinders. The four coupled wheels were 4 ft. 7½ in. diam., the bogie wheels 2 ft. 5½ in. diam. and the heating surface was 566 sq. ft. with a grate area of 9 sq. ft. In spite of their small size they were well-built, excellent little engines. They worked passenger trains between Lynn and Fakenham, sometimes running two double trips per day between Yarmouth and North Walsham. Towards the end of the century, when the railway was the joint property of the Midland and Great Northern, these little engines worked branch passenger trains at Lynn, on the Bourne and Spalding section, where Nos. 19 and 20 were generally to be seen, and the Mundesley-on-Sea branch, which for a long time was worked by No. 9. The other four engines of this class bore Eastern and Midlands numbers 8, 10, 40 and 41.

There were five 0-6-0 saddle-tank engines with outside cylinders 14 in. by 20 in. and coupled wheels varying from 3 ft. 4 in. to 3 ft. 9 in. diam., which for a time had the honour of conducting most of the goods traffic or of working mixed trains. Although anything but suited for the traffic they also did their share of passenger work at the Yarmouth end. Finally, there were eight 0-6-0 side-tank engines which had been built in 1873–4 by Sharp, Stewart and Co. for the Cornwall Minerals Railway, and came into the market at the psychological moment when locomotives were wanted for the lines in Norfolk. These engines had 3 ft. 6 in. coupled wheels, outside cylinders 16½ in. by 20 in. and carried 140 lb. pressure. The tanks had a capacity of only 780 gallons, and therefore Sharp, Stewart and Co. received orders to fit them with four-wheeled tenders, to carry water in addition to the engine side tanks. On the Eastern and Midland Railway these engines were numbered 1 to 3, 11 to 14 and 18.

With the addition of two diminutive four-wheeled contractors' engines, the above 22 engines formed the complete stock until early in 1882, and it may be noted that there was no engine on the line with driving wheels larger than 4 ft. 7½ in. For main-line passenger traffic such engines were too small, and at the end of 1881 there appeared the first four of a series of handsome 4-4-0 engines which were built by Beyer, Peacock and Co. The first four (Nos. 21 to 24) were delivered to the Lynn and Fakenham Railway and the later engines, Nos. 25 to 35, built from 1883 to 1888, to the Eastern and Midlands. The outside cylinders were 17 in. by 24 in., coupled wheels 6 ft. diam., total heating surface 1,083 sq. ft., and the total weight in working order nearly 38½ tons.

There were also two 2-4-0 passenger engines, Nos. 42 and 43, of the Allan "Crewe" type which were purchased in 1883 from the London and North Western Railway. These had 5 ft. 1 in. coupled wheels and 17 in. by 20-in. cylinders, and had originally been Lancaster and Carlisle engines. One of them, London and North Western Railway 1112, I remember very



2-4-0 MIXED TRAFFIC ENGINE NO. 18.
Rebuilt at Melton Constable from 0-6-0 Cornwall Minerals Railway 0-6-0 Tank Engine.
Coupled wheels, 4-ft. 7-in. diam. Cylinders, 16½-in. by 20 in.
(Reproduced from "The Engineer.")

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well on the Tebay and Ingleton branch early in 1883, a few months before it was sold to the Eastern and Midlands Railway.

The bulk of the passenger trains between Lynn and Norwich, and between Melton Constable and Yarmouth were, of course, worked by the 4-4-0 engines 21 to 35. These engines also worked the former Cromer expresses for a short period between Lynn and Peterborough.

When further passenger engines were required in 1890–1, Mr. Marriott, M.Inst.C.E., who then, as now, had charge of the locomotive and engineering departments, decided upon the metamorphosis of some of the 0-6-0 tank engines which had come from the Cornwall Minerals Railway. It was certainly a unique reconstruction to convert these engines into 2-4-0 passenger engines. The 16½ by 20-in. outside cylinders were retained, and four coupled wheels, 4 ft. 7 in. diam. were substituted for the former 3 ft. 6 in. wheels, but the same leading wheels were retained. To accommodate the larger wheels the frames were cut out and strengthened by a plate riveted inside.

The reason which induced Mr. Marriott to convert these engines was that the small 3 ft. 6 in. wheels of the original engines were quite unsuitable for main-line work, which consisted principally of fast and highly competitive cattle and fish traffic. As the engines were requiring heavy repairs it was decided to attempt to make serviceable locomotives of them, such as could be used for both passenger and goods traffic. The original engines caused many delays owing to their small wheels, and had often to be shunted for hours into sidings for other trains to pass them. Of the eight engines of this class, No. 18 was the first to be altered, and was followed by Nos. 3, 13, and 14. A full account of these transformed engines was given in *The Engineer* of October 31, 1890, from which the two illustrations of Nos. 14 and 18 have been taken.

(*To be continued.*)

ROYAL AGRICULTURAL SHOW, NEWCASTLE-ON-TYNE. LONDON & NORTH EASTERN RAILWAY PAVILION.

Designed by Mr. Stephen Wilkinson, A.F.C., F.R.I.B.A., this artistic pavilion was a distinctive feature of the Royal Agricultural Show held in July on the Town Moor, Newcastle-on-Tyne. There being no direct rail access, nearly all traffic had to be dealt with at the Central, Forth and Trafalgar goods stations, and carted by road, while the passenger traffic was chiefly concentrated at the Manors station to ease the pressure upon the Central station.

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The Southern Railway.

APPOINTMENT OF PRINCIPAL OFFICERS AND OUTLINE OF ORGANISATION.

AS mentioned last month, in preparation for inaugurating unified operation throughout the three sections of the new Southern Railway system, as from July 1, a number of appointments were announced early in June, of which the following may be repeated here for completeness :—

Secretary : Mr. Godfrey Knight.

Solicitor : Mr. William Bishop.

Chief Operating Superintendent : Mr. E. C. Cox, C.B.E.

Locomotive Running Superintendent : Mr. A. D. Jones, O.B.E.

Chief Accountant : Mr. C. A. de Pury.

Chief Commercial Manager : Mr. H. A. Sire, C.B.E.

Indoor Commercial Manager : Mr. F. H. Willis.

Outdoor Commercial Manager : Mr. G. T. Hedge, O.B.E.

Chief Engineer : Mr. A. W. Szlumper, C.B.E.

Deputy Chief Engineer : Mr. G. Ellson, O.B.E.

Chief Mechanical Engineer (for locomotives, carriages, wagons and road vehicles) : Mr. R. E. L. Maunsell, C.B.E.

Assistant Mechanial Engineer (for carriages, wagons and road vehicles) : Mr. S. Warner, O.B.E.

Deputy Assistant for Carriages and Wagons : Mr. A. H. Panter.

Docks and Marine Manager : Mr. G. S. Szlumper.

Electrical Engineer : Mr. Herbert Jones.

Assistant Electrical Engineer : Mr. H. Richards.

Stores Superintendent : Mr. C. Francis, C.B.E.

Assistant Stores Superintendent : Mr. A. P. Innocent.

Horse Superintendent : Mr. E. T. Stanley.

Chief of Police : Mr. R. Duckworth.

Estate Agent (S.E. and C. section) : Mr. W. J. Clayton.

Estate Agent (L. and S.W. and L.B. and S.C. sections and Isle of Wight) : Mr. W. I. Selwyn.

Assistant to Mr. Selwyn : Mr. F. G. Pinfold.

Rating Agent (S.E. and C. and L.B. and S.C. sections and Epsom and Leatherhead line) : Mr. S. E. Hitchcock.

Rating Agent (L. and S.W. section and Isle of Wight) : Mr. H. E. Judd.

The Southern Railway is the last of the four groups to decide on its organisation and to appoint its chief officers. Since January last, as a tentative arrangement, the former London and South Western, London, Brighton and South Coast, and South Eastern and Chatham systems have been run as three separate sections of the Southern Railway. The complexities of the financial arrangements prevented the terms being agreed for the merging of the three constituent companies until late last year. Consequently only a few appointments were then made, of the Secretary, Solicitor and Storekeeper as previously announced, and, pending the preparation of a new organisation, the three sections were otherwise operated under their own officers substantially as before amalgamation.

The chief interest in the new organisation, which came into effect on July 1, centres in the fact that a division has been made between the commercial and operating side of the railway business, and a new post created entitled "Commercial Manager." This officer takes over the commercial side of the work that used to be performed by the Goods Manager and the Superintendent of the Line in older forms of organisation ; whilst the Operating Superintendent takes over the control of goods station working, which previously came under the Goods Manager. An exception, however, is made in the case of the men engaged in the working of certain large goods stations, as they will be under the Commerical Manager. Cartage is also placed under the Commercial Manager. Canvassing, cartage and shed working at the large goods stations are so closely interwoven that it seemed only natural that the control of these three duties should be co-ordinated, and this is what has been

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Photo.] **MR. E. C. COX, C.B.E.** [*Elliott & Fry.*
Chief Operating Superintendent, Southern Railway.

MR. H. A. SIRE, C.B.E.
Chief Commercial Manager, Southern Railway.

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MR. R. E. L. MAUNSELL, C.B.E., M.I.Mech.E.

Chief Mechanical Engineer for Locomotives, Carriages, Wagons and Road Vehicles, Southern Railway.

MR. A. W. SZLUMPER, C.B.E., M.Inst.C.E.,

Chief Engineer, Southern Railway.

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MR. F. H. WILLIS,

Indoor Commercial Manager,
Southern Railway.

MR. G. T. HEDGE, O.B.E.,

Outdoor Commercial Manager,
Southern Railway.

Photo.] [*Elliott & Fry.*

MR. A. D. JONES, O.B.E.,

Locomotive Running Superintendent,
Southern Railway.

MR. S. WARNER, O.B.E.,

Assistant Mechanical Engineer for
Carriages, Wagons and Road Vehicles,
Southern Railway.

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aimed at in placing the working of the large goods stations under the Commercial Manager instead of the Operating Superintendent.

The only dual position in the organisation is that of the Locomotive Running Superintendent. He is responsible to the Operating Superintendent for the control of the engine crews and for the working of the engines while in traffic, and is equally responsible to the Chief Mechanical Engineer for running repairs to the locomotives executed in the running sheds.

The organisations of the four "grouped" British railways differ each from the other in many respects. That of the London Midland and Scottish, when announced at the end of last year, was definitely stated to be merely an interim organisation. It progressed in the direction of dividing commercial from railway operating work, but not to the same extent as has been done in the new Southern organisation now announced. The Great Western organisation is practically the old Great Western organisation with the addition of a Chief Docks Manager and certain new districts formed for the superintendence of lines previously owned by local companies which had been absorbed. The London and North Eastern Railway has adopted the nearest approach to the American divisional organisation of any of the groups. It has a comparatively small headquarters staff under a Chief General Manager, with three Divisional General Managers in charge respectively of the Southern, North Eastern and Scottish areas; these three officers fulfilling very much the same functions as are usually entrusted to the Division Superintendents of an American line. Mechanical engineering departments are correlated under one head, but civil engineering is still allocated substantially according to the respective component systems.

MR. GILBERT S. SZLUMPER,
Docks and Marine Manager,
Southern Railway.

Photo.] [*Elliott & Fry.*

MR. G. ELLSON, O.B.E.,
Deputy Chief Engineer,
Southern Railway.

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Institute of Transport Congress.

SHEFFIELD, JUNE 13-16, 1923.

THIS, the third Congress of the Institute since its formation in 1919, must be regarded as a highly satisfactory successor to its predecessors in Manchester and London, respectively. It is true that the numbers attending hardly came up to expectations, but the papers read were good and elicited interesting and instructive discussions; the arrangements made by firms, railways and others whose premises were visited were very highly appreciated, as also the provision in connection therewith by the railway companies and transport undertakings serving the district; the social functions were very popular; and no one who was privileged to participate came away without a sense of general satisfaction and without having added very materially to his knowledge of industry or transport.

The local committee included the following gentlemen: Sir John E. Eaglesome, K.C.M.G. (*Chairman*) and Messrs. A. R. Fearnley, O. C. Gatenby, H. N. Gresley, C.B.E., F. O. Kirby, W. McGibbon, Lenox Napier, H. Pickard, M.B.E., T. P. Sykes, L. V. Warhurst, W. H. Watson and R. J. Armstrong. The Hon. Local Secretariat consisted of Messrs. W. H. Breach, O.B.E., E. H. Causer and J. Smith. Mr. H. Winter Gray acted as General Secretary on behalf of Mr. H. E. Blain, C.B.E., Hon. Secretary of the Institute. Although many chief and district officers of various railways were present, the fact that certain important conferences were being held at the same time caused the railway side of transport to be relatively poorly represented, but other sections of the transport industry assembled in full force.

The delegates and visitors were welcomed by the President of the Institute, Sir Sam Fay, at a reception at the Grand Hotel on the Wednesday evening. There was a large gathering and during the evening a pleasing musical programme was carried out. Among those present were Sir J. G. Broodbank (President-elect), Mr. A. Neal, formerly Parliamentary Secretary to the Minister of Transport, together with members of the Council and others.

The Congress proceedings took place in the Cutlers' Hall, and on Thursday morning, in the Banqueting Hall of that famous building, the Lord Mayor of Sheffield (Mr. Alderman W. C. Fenton) formally opened the Congress and extended a civic welcome to the delegates. The Lord Mayor was supported by Sir Sam Fay, Sir J. G. Broodbank and Sir John Eaglesome. In welcoming the delegates the Lord Mayor said that Sheffield appreciated the compliment which the Institute paid it in holding there a Congress with such a wide range of interest. It was, moreover, exceedingly appropriate that the Institute should hold a Congress in Sheffield because the city provided every essential for transport, except, he thought, canal barges. Steel was the first essential of transport of almost every description, and Sheffield steel products had the highest reputation throughout the world.

It might be said that in the last century railways took the place of roads, but he rather thought that in the present century the roads were getting a bit of their own back. Owing to the introduction of internal-combustion engines, motor traffic was increasing by leaps and bounds, and he thought it was correct to say that the railways were feeling the influence of the increase. In Sheffield they had the essentials for railways in the rails that were made in the district—the finest rails in the world. The visitors would also find in the city one of the best examples of tramway transport in the United Kingdom. If he were to judge by the number of deputations which Sir Henry Maybury sent to Sheffield he thought they had also some good roads to show. He hoped that in their discussions the members of the Institute would keep in view the question of reducing costs in order to aid industry.

Sir Sam Fay, in acknowledging the welcome, said that when the Council of the Institute of Transport decided on Sheffield as the meeting place for the 1923 Congress they were actuated by three considera-

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tions. One was the close alliance between Sheffield and transport. Transport needed steel in some shape or form to carry on its civilising work. The products of Sheffield extended to the four corners of the earth; wherever, at any rate, English transport companies operated there would be found the products of that famous city. A second consideration was that situated midway between the seas, and midway between the rivers Mersey and Humber, Sheffield, above all industrial centres in the country, required adequate transport facilities, and the students and graduates of the Institute would be able to study on the spot the various transport organisations on which the city relied. The third consideration was the knowledge that to the Institute of Transport Sheffield would extend its proverbial welcome. In that they were not disappointed, and on behalf of the Institute he thanked the Lord Mayor for opening the Congress and for the hearty welcome accorded to the delegates. The Lord Mayor suitably responded and subsequently left the hall.

On Thursday evening, the Rt. Hon. the Lord Mayor and the Lady Mayoress of Sheffield (Mr. Alderman and Mrs. W. C. Fenton) entertained the delegates to the Congress and their ladies to a Conversazione at the Town Hall. On Friday evening, June 15, the Master and Mistress Cutler (Mr. and Mrs. R. W. Matthews) entertained the delegates and their ladies to a Conversazione at the Cutlers' Hall.

On June 14, in the Banqueting Hall, a paper was read by Mr. J. A. Jenkinson, Assistant Traffic Superintendent, Grimsby, Great Central Section, London and North Eastern Railway, on "The Railway Requirements of an Important Industrial Area." Sir Sam Fay was in the chair. This led to an interesting discussion, in which Mr. C. le M. Gosselin, Sir John Eaglesome, Mr. J. Smith (London Midland and Scottish goods agent, Sheffield), Mr. D. Halliwell (Assistant to General Superintendent, Western Division, London Midland and Scottish Railway) and the President took part.

This was followed by a paper on "Modern Trackwork and its Importance," by Sir Robert Hadfield, Bart., D.Sc., F.R.S., in which many practical considerations were discussed, particular emphasis being laid on the value of manganese steel for track conveying heavy traffic and where replacements and renewals are difficult, inconvenient and expensive. Speakers in the discussion were Messrs. F. Bland, Nugent Clougher, and Cecil J. Allen.

At the same time, in the drawing room of the Cutlers' Hall, Major-General Sir W. Sefton Brancker, K.C.B., A.F.C., read a paper on "Air Transport." Speakers included Sir J. G. Broodbank (in the chair), Mr. Arthur Neal, Mr. Handley Page and Colonel Searle.

On the Friday, a paper on "Cargo Handling at Ports: British and American Methods Compared," by Mr. Brysson Cunningham, D.Sc., B.E., M.Inst.C.E, editor of *Dock and Harbour Authority*, attracted a large attendance It was illustrated by lantern slides. Sir Joseph Broodbank (P.L.A.), Chairman, and Messrs. Ross-Johnson, C. Bentham, J. Paterson, H. Hopperton, G. B. Lissenden and W. H. Gaunt spoke in the discussion. Other papers read and discussed that morning were: "Some comparisons of British and American methods in road construction and maintenance," by Mr. A. Dryland; and "Tramways, from a traffic point of view, under existing conditions," by Mr. E. S. Rayner.

Five visits were arranged for the Thursday afternoon. The party for the works of Messrs. Vickers, Ltd. and Metropolitan-Vickers, Ltd. was entertained at luncheon by the directors of Vickers, Ltd., at the River Don Works. Mr. Wm. Clark, J.P., welcomed the visitors, a suitable response being made by Mr. Arthur Balfour, a leading steel manufacturer of Sheffield. Sir Joseph G. Broodbank replied on behalf of the visitors. Subsequent to the luncheon a tour was made of the very extensive works under the guidance of departmental officials. The party were then conveyed to the Attercliffe Common works in motor cars. The visitors returned to the main offices, where tea was served, after which a return was made by means of special tramcars.

Another party visited the East Hecla Works of Hadfields, Ltd. Prior to the visit Sir Robert Hadfield entertained the Council of the Institute, and others, to lunch. During the afternoon the visitors and others were conducted through Messrs. Hadfield's works, those at Tinsley covering

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no less than 225 acres. The steel foundries are the most extensive of their kind in the world, covering over 12 acres of floor space. The forge and smithy occupy 21,000 sq. ft., and the two machine shops 200,000 sq. ft. Altogether the buildings cover over 50 acres. The plant is capable of producing 200,000 tons of steel per annum, and, during the war, there were 15,000 persons on the works' pay roll.

A third party visited Messrs. Steel, Peech, and Tozer's Works. On arrival at the works the visitors were received by Mr. James Peech, Mr. A. Jollie, Mr. J. W. Russell and several departmental chiefs, and under their guidance were taken through the new Templeborough rolling mills and the United strip and bar mill. Subsequently, the visitors were entertained to tea in the firm's offices, and Mr. C. Bentham, on behalf of the party expressed their thanks to the firm and to Mr. James Peech, Mr. A. Jollie and the departmental chiefs for their courtesy and kindness. Mr. James Peech suitably responded, and the party then left for Sheffield by special tramcar. Other visits arranged for Thursday were to the works of the Parkgate Iron and Steel Company, at Rotherham, and the Applied Science Department of Sheffield University.

Friday's programme also included five visits.

In connection with the visit to the Penistone Works of Cammell Laird and Co., Ltd., the firm also invited a number of guests, representative of British, Foreign and Colonial railways, and members of the technical press to visit the Penistone works. This party was conveyed by special train leaving Marylebone at 9.15 a.m., picking up the Institute of Transport members at Sheffield, and running straight to Cammell Laird's Penistone works. Breakfast was served on the downward journey and dinner on the journey back, Marylebone being reached at 8.5 p.m. Mr. W. L. Hichens, chairman, Cammell Laird and Co., Ltd., made a brief speech after luncheon and welcomed the members of the Institute of Transport and their other guests. Sir Sam Fay, on behalf of the Institute of Transport, thanked Mr. Hichens and the directors of Cammell Laird and Co., Ltd. for their hospitality. The party then proceeded on a tour of inspection of the works, which cover a total area of approximately 60 acres, situated on both sides of the London and North Eastern Railway, immediately adjacent to Penistone station.

The Works of John Brown and Co., Ltd. and Thos. Firth and Sons, Ltd. were visited by another party. John Brown and Co., Ltd. had arranged that the visitors should be able to witness the rolling of an armour plate of some 50 tons, and that both their 3,000 and 6,000 ton presses should be in operation. Another section which proved of special interest was that containing the electric steel furnaces, while there was much to be seen in the forge mill, the spring and buffer shops, and in the machine shops, where many examples of special work, requiring machines of large dimensions and capacities, were in hand.

After leaving John Brown's works, the visitors were handed over to the representatives of Thomas Firth and Sons, Ltd. The area of the works, including those at Tinsley, is approximately about 30 acres. The Brown-Firth Research Laboratory, maintained by the two firms jointly, was then inspected, the various testing appliances and the equipment for metallurgical and chemical research, &c., being clearly explained by Mr. Bolsover, Assistant to Dr. Hatfield, the well-known Sheffield metallurgist. During tea a film showing methods of steel manufacture was shown in the lecture theatre attached to the laboratory.

A third party visited the works of Craven Bros., Ltd., at Darnall. On arrival the party was received by Mr. Harold Craven, a director, and Mr. W. H. Anderson, general manager, with whom was Mr. A. E. Cook, works manager. In the erecting departments there were on view all-steel wagons of high capacity for the Great Indian Peninsula Railway. On the completion of the tour the visitors were entertained by the directors at tea in the main offices.

One of the most popular visits to the railway delegates was that to the Doncaster Plant Works of the London and North Eastern Railway. A special train was placed at the disposal of the visitors by the courtesy of the railway company. On arrival at Doncaster the party was met by Mr. H. N. Gresley, Chief Mechanical Engineer, Mr. F. Wintour, Assistant Mechanical Engineer (Southern Area), and others, and escorted on a comprehensive

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tour through the extensive works. An admirably arranged booklet, prepared in connection with the visit, and profusely illustrated with photographic reproductions of locomotives, coaches and wagons, was handed to each visitor in the course of the outward journey, and as this booklet included a sketch plan, indicating the shops to be visited and showing the arrangements for the inspection, its possession added greatly to the enjoyment of the visit. The delegates were divided into parties of ten, each in charge of a member of Mr. Gresley's staff. The concluding item of the visit, was the opportunity afforded for a close inspection of the Royal train, built throughout at the Doncaster Works. One of Mr. Gresley's new 1470 " Pacific " type locomotives, which had recently been completed and tested for service, was in the yard and opportunity was taken of making a careful inspection of this powerful locomotive, as well as one of the most recent heavy freight engines standing nearby. The area of the Plant Works is 84 acres, of which 19 are covered by workshops. The wagon shops occupy an area of 8½ acres. At the end of 1922 approximately 4,000 workmen were employed at the " Plant," more than half of this number being in the locomotive shops. There was no opportunity for a formal vote of thanks to be passed, but Mr. A. Winter Gray, on behalf of the Institute, cordially thanked Mr. Gresley, Mr. Wintour and all associated with them for their kindness and courtesy, while numerous other delegates personally added their tributes of appreciation. Altogether, it was a most enjoyable visit, participated in by Mr. J. G. Robinson, formerly Chief Mechanical Engineer, Great Central Railway, among others. The visitors returned to Sheffield by special train at 5.5 p.m. from Doncaster, and *en route* were entertained to tea by the courtesy of the London and North Eastern Railway Company.

The remaining visit was to the Works of the Staveley Coal and Iron Co., Ltd., the party travelling to and returning from Staveley Works station by train.

Saturday was devoted entirely to visits, two being arranged.

A special train provided by the London and North Eastern Railway Company left Sheffield at 8.30 a.m. for Grimsby. Alighting at the Docks station, the visitors were conducted by Mr. F. Patman, O.B.E., District Traffic Manager, and his assistant, Mr. J. A. Jenkinson, round the fish docks, where, although the pressure of morning work was by that time easing off, there remained abundant evidences of the tremendous scale upon which fish traffic is dealt with, and which has caused Grimbsy to be the busiest fishing port in the world. At the ordinary quays trade is brisk all the year round, and a number of fish trains are despatched daily to various parts of the British Isles. To meet the needs of the herring season, extension premises are available, though their use is necessarily seasonal. An ice factory, the Royal and Alexandra Docks and timber pond, together with the dry docks, sheds and wharves were then inspected, the Continental shed, adjacent to which several railway steamers were berthed, receiving special attention.

Returning to the special train, light refreshments were supplied during the journey to Immingham, passing the extensive reception sidings, and the visitors were then conducted round by Messrs. J. R. Bailey, M.B.E. and R. H. Hellyer, Assistant Portmasters and their staffs, together with Messrs. Patman and Jenkinson and others from Grimsby. Mr. C. W. Neele, electrical engineer, Great Central Section, London and North Eastern Railway, and the Resident Electrical Engineer, Mr. H. Gill, were also present, and explained plant with which they were particularly associated. Special interest attached to an inspection of the electrically-driven pumps operating in connection with the dry docks, &c. The visitors were able to observe the system of gravity lines by which full wagons are supplied to the coal hoists, the operation thereof, and the upper gravity roads by which empty wagons run away to the empty sidings. The visitors were taken up one of the hoists, thus obtaining a bird's-eye view of the whole of the premises, the reception sidings containing wagons representing some 9,000 tons awaiting shipment. The granary (capacity 15,000 tons) and warehouses were also inspected. On rejoining the special train for return to Sheffield, Mr. E. S. Shrapnell-Smith, C.B.E., and Mr. Sidney Preston, C.I.E., C.B.E., expressed to the railway officers, on behalf of the Institute of Transport, appreciation

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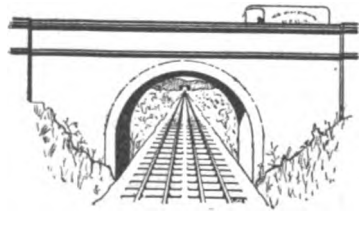
of the arrangements made in connection with the visit.

The last, but by no means the least important, visit in connection with the Sheffield Congress was that paid to the port of Goole and the Aire and Calder Navigation. In this case a large body of delegates, many accompanied by ladies, left Sheffield by special train kindly provided by the London and North Eastern Railway at 9 a.m., arriving Goole shortly before 10 o'clock. There the party was met by Sir John Eaglesome, Managing Director of the Aire and Calder Navigation, Lord Deramore (director), and Mr. G. W. Winterbottom, Steamship Manager (East Coast), London Midland and Scottish Railway, while Mr. W. H. Breach, Traffic Manager of the Aire and Calder Navigation, travelled from Sheffield with the visitors.

The party walked to the north end of the Stanhope dock and, after observing the working of the underslung jib cranes engaged in transferring bales from wagons to ships' hold and noting their effectiveness, embarked on the ss. *River King* for an inspection of the docks. The visitors subsequently disembarked at the No. 4 (Floating) Compartment Boat Hoist in order to inspect the method of shipping coal ex compartment boats—a unique method of working by which the Aire and Calder Navigation have for many years economically carried coal from the mining districts to Goole for shipment. This method of coal transport is claimed to be the most economical means of inland water transport for coal in the world. The coal is loaded direct from the pit screens into a 40-ton compartment boat, this reaching the pit mounted on a bogie. Transferred when loaded, it is placed in the water and marshalled along with others into a "train." Each of these compartment boats is 20 ft. long by 15 ft. beam by 8 ft. deep and is fitted with a pair of spring buffers at one end, thus allowing the "train" to straighten itself after negotiating a bend in the waterway. A "train" comprises a tug, with headpiece, and 19 compartment boats; thus 700 to 800 tons of coal are conveyed from the waterside collieries to Goole by a single tug, with a crew of four men. The Aire and Calder Navigation have 1,100 of these boats. Arriving at the compartment boat hoist, the units of the "train" are drawn in succession to the hoist and each 40-ton compartment boat is raised bodily out of the water and its contents tipped into the ship's hold.

Embarking on the *River King*, the delegates left Goole for Pollington Lock, a journey of 9½ miles, and on arrival were entertained to luncheon by the Aire and Calder Navigation. Sir John Eaglesome presided. In proposing a vote of thanks to the Aire and Calder Navigation for their kind hospitality, Sir J. G. Broodbank, President-elect of the Institute of Transport, expressed, on behalf of the delegates, the gratitude of all for the excellent and instructive excursion and also for the sumptuous luncheon. Sir John Eaglesome responded in a happy vein, and subsequently the *River King* returned to Goole. The visitors left Goole at 2.30 p.m. by special train for Sheffield, where they arrived at 3.25 p.m. A handsome booklet illustrating the principal features of the visit and giving the history of the Aire and Calder Navigation was presented to each visitor.

During the Congress the visitors were privileged to travel freely on the Sheffield Corporation tramways and motor 'buses, while the railway companies issued tickets at reduced fares to members and delegates.



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SIR PERCY TEMPEST, K.B.E.

AMONG the Birthday Honours announced on June 30 one of the most popular is that of K.B.E. (Civil Division), conferred by His Majesty the King upon Sir Percy Crosland Tempest, C.B.E. Sir Percy Tempest is one of the three general managers of the Southern Railway Company. Previously he was General Manager to the South Eastern & Chatham Railway Companies' Managing Committee, to which he was appointed early in 1920 in succession to Sir Francis Dent, still retaining the office of Chief Engineer, which he had held since 1899. He has been Engineer to the Channel Tunnel Company since 1896. He performed many important public services during the war, in recognition of which he received the honour of C.B.E. in 1918, and was made an officer of the Order of Leopold by the King of the Belgians in 1919.

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Summer Train Services. [No. II.]

IN the July number the principal features of the summer train services arranged by the Great Western and London & North Eastern Railways, together with those of certain smaller systems and some of the Irish companies, were outlined. At the last moment, too, we were able to include a few notes as to London Midland and Scottish Railway services. These are now further considered, together with those of the Southern Railway, thus completing our review of the Summer Train Services for 1923.

LONDON MIDLAND AND SCOTTISH RAILWAY.

Western Division.

Commencing July 9, a number of important developments were made in the Anglo-Scottish services, notably, the inauguration of a new through train from Penzance and the West of England, via Bristol, Hereford and Shrewsbury, to Stirling, Perth and Aberdeen, a total distance of 725 miles. The northbound train leaves Penzance at 12 noon, and Plymouth at 3.55 p.m. There is a connection from Torquay at 4.23 p.m., Exeter is left at 5.25 p.m. and Bristol at 7.20 p.m., the latter being also the time of the Cardiff connection. Calls are made at Pontypool Road (8.20 p.m.), Hereford (9.15 p.m.) and Shrewsbury (10.30 p.m.). No booked stops are shown in the public time-tables between Shrewsbury and Stirling, reached at 5.25 a.m., Perth 6.7 a.m., and Aberdeen 7.52 a.m. Connection is made with the mail train from Perth to Inverness, reached at 9.50 a.m. The return train leaves Aberdeen at 12.30 p.m., with a connection from Inverness at 10.30 a.m., and reaches Bristol at 5.46 a.m., Plymouth 10 a.m. and Penzance 1.20 p.m. The northbound train has somewhat later Scottish arrivals on Sunday mornings.

Notable accelerations are made in the Scottish services from London (Euston). The 10 a.m. arrives Glasgow, Edinburgh and Aberdeen respectively 15 minutes earlier; the 1.30 p.m. reaches Glasgow and Edinburgh 10 minutes earlier; the 7.30 p.m. (altered to 7.40 p.m.) reaches Perth 43 minutes earlier, Aberdeen 40 minutes earlier, and Inverness 65 minutes earlier. The 11 p.m., altered to 11.35 p.m. (Saturdays excepted), is re-timed to arrive Edinburgh, Aberdeen and Inverness, 10, 10, and 65 minutes earlier, respectively. Similar accelerations are made in the reverse direction. An additional train for the Highlands leaves London (Euston) at 7.30 p.m., July 27, to August 14 (Saturdays and Sundays excepted) and runs to Inverness via Forres and Nairn, with connections to Elgin and Lossiemouth. The return train leaves Inverness at 4.15 p.m., and runs from August 27 until the end of the season.

One of the most popular trains in pre-war days was the North Wales morning express. Hence its restoration as a non-stop train is of special interest. The 11.10 a.m. from London (Euston) now runs to Prestatyn, 205½ miles, without intermediate stoppage, thence serving Rhyl, Colwyn Bay, Llandudno, Bangor, Criccieth, Portmadoc and Pwllheli, with connections to all the popular resorts in North Wales. The return train leaves Pwllheli at 10.25 a.m. and Prestatyn 12.47 p.m., reaching London at 5.5 p.m.

A through express service is given by the 10.40 a.m. and 1.15 p.m. from Euston to the Spas of Central Wales, Llandrindod Wells, Builth Road, Llangammarch Wells and Llanwrtyd Wells, with return trains from the last mentioned station at 9.20 a.m. and 11.59 a.m. A new service is also given from Euston at 11.35 a.m. for Blackpool (Central), Windermere and Keswick 6.30 p.m.

The new daylight service to Belfast via Stranraer and Larne in connection with the 10 a.m. from Euston, gives an arrival in Belfast at 11.5 p.m.; the return service leaves Belfast 9.5 a.m. due in London (Euston) at 10 p.m.

Other developments include trains from Liverpool (Lime Street) at 9.30 a.m. and Manchester (Exchange) at 10.17 a.m., and from Manchester (Victoria) at 10.8 a.m. (Saturdays excepted) or 9.50 a.m. (Saturdays only) for Scarborough, with return services from Scarborough at 2.20 p.m. by the former route and 2.45 p.m. by the latter route, and trains from Manchester (Exchange) at 11.15 a.m. and Liverpool (Lime Street) 12.10 p.m. for Bangor, Pwllheli, Criccieth and Portmadoc, with returns from the last mentioned station at 12 noon to Manchester and 1.50 p.m. to Liverpool.

An additional express is provided between Euston and Birmingham, the down train leaving London at 8.30 a.m. and, after serving Coventry, reaches Birmingham at 10.50 a.m., while the up train (Saturdays excepted) leaves New Street at 8.20 p.m., and, with a call at Coventry, is due in London at 10.20 p.m. The 5.20 p.m. from Liverpool to London is accelerated to reach

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Euston at 9.5 p.m. (9.15 p.m. on Saturdays.) Reference may also be made to the 10.25 a.m. restaurant car train from Liverpool (Lime Street), and Manchester (London Road) 10.52 a.m., to the Eastern Counties, travelling via Stoke-on-Trent and Nottingham. The return train leaves Lowestoft at 10.30 a.m., Yarmouth (Beach) 11.8 a.m., and Cromer 11.38 a.m. The Hull and Zeebrugge route is again served by the twin-screw steamer *Duke of Clarence*, with through trains between Liverpool and Manchester and Hull in connection as usual. All the usual through services in conjunction with other companies are, of course, to be maintained, including trains from Liverpool and Manchester to Bournemouth and South-

at 4.18 p.m. to Bradford, in connection with the 12.15 p.m. from St. Pancras, and from Bradford at 3.10 p.m. to Leeds, in connection with the 3.45 p.m. train, thence to St. Pancras, conveying through carriages in each direction between Bradford and London. The 3.15 p.m. Sunday train from St. Pancras is now accelerated to reach Sheffield at 6.53 p.m., Leeds 8.5 p.m., and has a through portion for Bradford, due 8.38 p.m. The 12.15 p.m. Sunday train from Leeds is accelerated to reach St. Pancras at 5.27 p.m.

A new feature of the St. Pancras-Harrogate service is the dining facilities provided by the running of 1st and 3rd class restaurant cars on the 11.45 a.m. from St. Pancras through to Harrogate. The cars return

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*F. E. Mackay.*

Euston-Manchester Restaurant Car Express. London and North Western 4–4–0 locomotive No. 2282, "Richard Arkwright."

ampton, via Crewe and Birmingham (New Street), Liverpool, Manchester, Birmingham, &c., and Brighton and Eastbourne and the Kent Coast resorts. New trains between Wolverhampton and Walsall and Derby and Nottingham may also be mentioned.

Midland Division.

While, in general, the additions to be made to these services correspond to those which usually occur to meet the special needs of the summer months, several items may be selected for reference. Thus, the 9 a.m. and 9.15 p.m. trains from St. Pancras to Edinburgh are accelerated to reach Edinburgh at 6.19 p.m. and 7.5 a.m. respectively. A new express runs from Leeds from Harrogate to St. Pancras on the 12.3 train. These facilities augment the ordinary through carriages and through trains between St. Pancras and Harrogate.

A through service to Bournemouth is run from Lincoln at 10.40 a.m., via Nottingham, Leicester, Birmingham and Bath. The return train leaves Bournemouth at 9.50 a.m. There is also a new train from Bradford at 8.15 a.m. and Leeds at 8.50 a.m. to Sheffield in connection with the 9.52 a.m. from Sheffield to Bournemouth, with a corresponding return service from Bournemouth at 10.45 a.m. The 12 noon from Bradford to Bristol also has a Bournemouth portion Among various other services may be mentioned the 9.30 a.m. from Birmingham

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to York and Scarborough, and 3.10 p.m. from Scarborough to Derby and Birmingham; through services from Liverpool and Manchester to Cromer, Yarmouth and Lowestoft, and between Sheffield, Leicester, and Nottingham and Llandudno; also between Leicester, Nottingham and Sheffield and Blackpool, and between Bradford and Morecambe.

SOUTHERN RAILWAY.

London and South Western Section.

The summer train services inaugurated on July 9 include several interesting features. The 11.30 a.m. from Waterloo to Bournemouth is accelerated by 13 min. and extended to Swanage. The 3 p.m. from Waterloo to Plymouth no longer calls at Templecombe, Axminster, Honiton and Sidmouth Junction, realising improvements of about half-an-hour to Exeter and Plymouth and 50 min. to Ilfracombe. It also has a connection to Padstow in place of that previously given by the 1 p.m. from Waterloo, reducing the time from London to Padstow by 84 min. The journey time from London to Bude by the 1 p.m. from Waterloo is also reduced by 23 min., a new connection being provided off the 3 p.m. train. Similarly, the 6 p.m. from Waterloo to Exeter does not call at Axminster and Honiton and is extended to Plymouth. Associated developments are a new train from Plymouth at 10 a.m. to Exeter, in connection with the 12.30 p.m., thence to London; acceleration of the 2.30 p.m. from Exeter to Waterloo by the withdrawal of the Yeovil Junction stop; and a new service from Ilfracombe at 12.50 p.m. to London, serving principal stations *en route*.

Special interest attaches, however, to developments on the Portsmouth line, including new trains from Waterloo to Portsmouth Harbour at 10.50 a.m., and on Saturdays at 11.50 a.m. and 1.50 p.m., while the old 4.50 p.m. train now starts at 5.50 p.m. and ceases to call at Guildford, Godalming, Milford, Witley, Liphook, Liss, Petersfield and Rowlands Castle. This train is therefore appreciably accelerated, though it calls additionally at Woking. To serve stations omitted by the accelerated train a new train leaves Waterloo at 5.24 p.m. In the opposite direction, the 8 a.m. from Portsmouth Harbour leaves at 7.45 a.m. and ceases to call at Guildford, reaching Waterloo at 9.52 a.m.; the 10 a.m. starts at 9.40 a.m.; the 12.15 p.m. leaves at 11.50 a.m. and ceases to call at Havant, Petersfield, Haslemere and Godalming; while the 2 p.m. train leaves at 3.50 p.m. All the usual summer expresses are, of course, restored, except as modified by the new facilities, including the 10 a.m. from Waterloo to Exeter, Padstow and Bude; 10.30 a.m. Waterloo to Bournemouth, Swanage and Weymouth; 12 p.m. Waterloo to Lyme Regis, Seaton, Sidmouth and Exmouth; 2.30 p.m. Waterloo to Bournemouth, Swanage and Weymouth; 9.55 a.m. Padstow, 10.50 a.m. Bude and 1 p.m. Exeter to Waterloo, due 4.30 p.m.; 10.15 a.m. Exmouth, 10.55 a.m. Sidmouth, 11.30 a.m. Seaton, and 11.35 a.m. Lyme Regis to Waterloo, due 3.8 p.m.; 11.15 a.m. Weymouth, 11.20 a.m. Swanage and 12.15 p.m. Bournemouth West to Waterloo, due 2.50 p.m., and 3.17 p.m. Weymouth, 3.25 p.m. Swanage and 4.15 p.m. Bournemouth West to Waterloo, due 6.58 p.m.

Local services on the Sidmouth, Exmouth and Budleigh Salterton branches have been considerably augmented, and pre-war non-stop business trains between Exmouth and Exeter restored. With regard to through services in conjunction with other companies, the 11 a.m. from Oxford to Eastleigh is extended to Bournemouth, and balanced by a new train from Bournemouth at 3.28 p.m. The 11.20 a.m. from Cardiff to Brighton, and 11.20 a.m. from Brighton to Cardiff start at 12.10 p.m. and 12 noon respectively, and are accelerated, running direct via Cosham and Havant instead of via Portsmouth. The old arrival at Brighton is maintained, that at Cardiff being 12 min. earlier. The programme of day excursions is supplemented by additional combined rail and motor trips in the West of England and the Isle of Wight.

In view of the fact that the railways in the Isle of Wight are now incorporated in the Southern system, the local train services have been remodelled to provide, substantially, at least one train in each direction between Ryde and Ventnor (additional trains between Ryde and Shanklin during the afternoon), Brading and Bembridge, Ryde, Newport and Cowes, and Sandown, Newport and Cowes, and between Newport, Merstone and Ventnor.

"Brighton" Section.

Commencing July 9, all the standard additions were made, together with a few additions. The following trains may be mentioned: From Victoria, 11.15 a.m. to Eastbourne, 12.45 p.m. to Brighton and Worthing, 1.35 p.m. to Littlehampton and Bognor, and 6.40 p.m. to Littlehampton; from London Bridge, 10.30 a.m. to Littlehampton and Bognor, and 11.40 a.m. (Saturdays only) to Brighton. Return trains are provided from Brighton at 3.30 p.m. (Saturdays only), and 8.30 p.m. (also Saturdays only); from Eastbourne at 4.30, 6.15 and 7.50 p.m.; from Bognor at 2 and

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5.30 p.m., and from Littlehampton at 2.5 and 5.30 p.m. On Sundays the principal new trains are the 8.35 a.m. from Victoria to Littlehampton and Bognor, and the 9.25 a.m. to Eastbourne, together with the return services from Bognor and Littlehampton at 6 p.m. and from Eastbourne at 8.40 p.m. Additional trains are provided both week-days and Sundays, on the Coast lines. A considerable number of main-line trains, week-days and Sundays, have been accelerated.

On Saturdays (July 28 to September 1) there will be a new through train to Brighton, leaving Birmingham 1.54 p.m., and on Saturdays, from August 4 to September 29, to Birmingham from Brighton at 11.5 a.m. and 5.45 p.m. on Sundays. Corresponding return trains leave Ashford with connections from the above stations for Brighton.

Two new rail motors have been introduced in the Littlehampton and Bognor services. Additional rail motor services now run between Streatham, Thornton Heath and Croydon, Crystal Palace and Coulsdon, and Crystal Palace and West Croydon, giving improved connections between local stations and East Croydon. On Sundays there is now a 20-min. service of electric trains between Victoria and the Crystal Palace. A new hourly service of electric trains has been introduced on Sundays between London Bridge and the Crystal Palace via Tulse Hill.

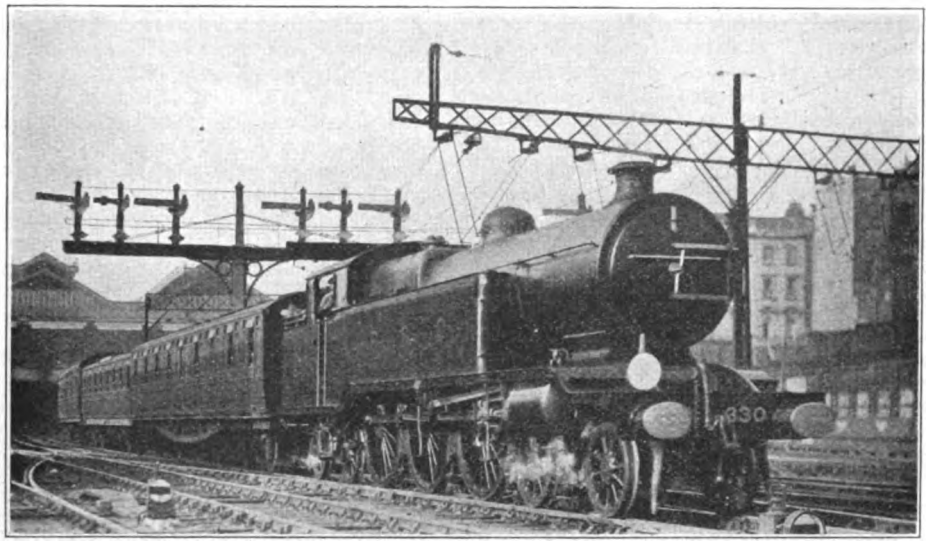

Photo.] SOUTHERN RAILWAY. [*F. E. Mackay.*

6.35 p.m. 60-minute London-Brighton Express leaving Victoria.
London, Brighton & South Coast Railway 4-6-4 tank engine No. 330.

The through train every weekday to and from Cardiff, Newport, Bristol, Bath, Ilfracombe, Exeter, &c., and Brighton, Worthing, &c., runs via the Cosham direct line and is accelerated by about 1½ hours. It has through carriages to and from Plymouth, and connections to and from Padstow, Bude, Torrington, Bideford, Sidmouth, Seaton, Lyme Regis, &c. This train connects at Brighton with trains to and from Eastbourne, Hastings, Ashford, Canterbury, Ramsgate, Margate, Deal, Dover and Folkestone. New through trains have been introduced between Brighton and Ashford, with connections to Canterbury, Ramsgate, Margate, Folkestone, Dover and Deal, leaving Brighton 1.10 p.m. and 5.55 p.m. on weekdays

SOUTH EASTERN AND CHATHAM SECTION.

The summer service arrangements on this line were somewhat delayed owing to the late decision of the French Government in regard to the adoption of Summer Time, and the consequent difficulty in arranging routes for the Continental boat trains, which necessarily influence the ordinary train services. Principal alterations as compared with last summer, include the following: Night Paris service expedited to give an arrival at Victoria at 9.48 a.m.; new morning train from Ramsgate Harbour at 6.35 a.m., arriving Cannon Street 8.36 a.m., to meet the demand for an earlier arrival in London, and to relieve the 6.40 a.m. up Ramsgate Harbour train, which now starts from

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Margate West at 6.56 a.m.; 8.3 a.m., Margate West to Cannon Street accelerated 16 minutes, arriving Cannon Street 9.52 a.m. Several additional trains in each direction on Saturdays and Sundays have been arranged, and are advertised in the time-tables instead of being run as reliefs to the ordinary services. The Thanet Pullman Limited on Sundays leaves Victoria at 10.15 a.m. and arrives Margate at 11.45 a.m., Broadstairs 11.55 a.m., and Ramsgate Harbour 12.2 p.m. The return journey has been made about two hours later so as to give a longer day at the coast. The return train leaves Ramsgate Harbour at 7.5 p.m., Broadstairs 7.12 p.m., and Margate West 7.20 p.m., Victoria being reached at 8.50 p.m.

On the Folkestone, Dover and Deal route, additional trains have been arranged as follows: 8.30 a.m. Deal (9.15 a.m. Folkestone Central) to Charing Cross; 6.0 p.m. (not Saturdays) Charing Cross to Folkestone, Dover and Deal; 1.50 p.m. (Saturdays only) Charing Cross to Folkestone, Dover and Deal; 5.0 p.m. (Fridays only) Charing Cross to Folkestone, Dover and Deal; 9.35 a.m. (Sundays) Charing Cross to Folkestone, Dover and Deal; 6.0 p.m. (Sundays) Deal, Dover and Folkestone to Charing Cross. The 1.25 p.m. Charing Cross to Deal has been retimed to leave at 1.0 p.m., and will be an 80-minute train to Folkestone Central. On the Hastings route additional trains are provided on Saturdays at 8.30 a.m. and 2.0 p.m. from Charing Cross to Hastings, the return trains leaving Hastings at 1.30 and 3.15 p.m.

New through coastal services between Folkestone and Margate and Brighton have been arranged, and two trips each way are run on week-days and one on Sundays. The outward morning and return evening services connect at Brighton with the through West of England trains running between Brighton and Cardiff. The service between Ashford, Canterbury, Margate and Dover has been revised, and several additional trains provided. The 7.48 a.m. London Bridge to Ashford, serving Croydon and Redhill and districts, has been extended to Folkestone Central, so as to connect with the morning boats from Folkestone. The suburban services have been augmented during the middle of the day, and again after business hours at night. Sunday services in the London district have also been increased.

Photo.] SOUTHERN RAILWAY. [*E. A. Gurney-Smith.*

North-bound Ramsgate-Manchester Express passing Bromley Common, Kent. South Eastern and Chatham rebuilt 4-4-0 locomotive No. 502. London Midland and Scottish Coaches and Restaurant Car.

In connection with the boat train leaving Victoria (South Eastern and Chatham) station at 9.15 a.m., a sleeping car is now provided on the train in connection from Flushing, the car travelling through to Leipsic. This sleeping car conveys second as well as first-class passengers, and will, no doubt, be greatly appreciated by passengers travelling not only to Leipsic and Dresden, but also to Prague, Carlsbad, Marienbad and Czecho-Slovakian resorts.

During the summer months a special series

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of cross-Channel day trips has been arranged by the Southern Railway Company from Folkestone, Margate, Ramsgate, Dover, Deal and Canterbury to Boulogne, Calais, Ostend and Dieppe. The Southern Railway steamship *Victoria* is principally used for these trips, for which passports will not be required.

LONDON & NORTH EASTERN RAILWAY.

In addition to train service developments set forth last month, a few further items may be mentioned. The St. Pancras–Hunstanton restaurant car express, introduced last year, runs from July 23 until September 15, leaving St. Pancras at 11.20 a.m., and calling only at Cambridge, King's Lynn and Heacham, and reaching Hunstanton at 2.8 p.m. The return train leaves Hunstanton at 1.5 p.m. and will be due at St. Pancras at 4.2 p.m. The 2.25 p.m. train from Hunstanton to Liverpool Street leaves at 2.34 p.m. but continues to reach London at 6.10 p.m. The 4.44 p.m. express from Hunstanton to Liverpool Street is accelerated to arrive at 8.20 p.m., instead of 8.33 p.m. In addition to new and accelerated services as previously set forth, all the special facilities introduced last year reappear, including trains between Peterborough and Hunstanton, replacement of the ordinary 10 a.m. express by the 9.50 a.m. restaurant car express for Cromer, 9.55 a.m. for Yarmouth, Gorleston and Lowestoft, calling first at Beccles, and 10 a.m. for certain intermediate stations and Yarmouth and Lowestoft, 10.12 a.m. for Felixstowe and stations between Ipswich and Norwich, and 10.20 a.m. for the Harwich line, Ipswich and most stations thence to Yarmouth. On Saturdays an additional restaurant car express leaves Liverpool Street at 10.26 a.m. for Clacton-on-Sea only. Numerous other facilities could be mentioned, but they represent mainly the repetition of last summer's arrangements, together with certain additions and accelerations, or return journeys corresponding to the outward facilities mentioned. Sunday arrangements include corresponding additions and new facilities on a generous basis.

METROPOLITAN RAILWAY.

In general the additional facilities, accelerated services, &c., introduced in May meet the summer requirements. Commencing July 9, however, a few other changes took effect, including additional trains between New Cross and the Harrow line, and new trains from Uxbridge to Baker Street at 11 a.m. and 5.59 p.m. covering the journey in 35 min. in one case and 30 min. in the other.

SOMERSET AND DORSET JOINT RAILWAY.

From July 9 until September 30, express trains from the Midlands and North of England to Bournemouth leave Bath (L.M. and S.), at 2.30 p.m., 2.40 p.m., 4.0 p.m., and 6.35 p.m., arriving Bournemouth West 4.33 p.m., 4.40 p.m., 6.13 p.m. and 8.48 p.m. The 2.30 p.m. express provides a through service from Liverpool (Lime Street), Manchester (London Road), Leicester, Birmingham (New Street), Worcester and Cheltenham. The 2.40 p.m. train affords a through service from Harrogate, Bradford, Leeds, Newcastle, York, Hull, Sheffield, Nottingham, Derby, Burton, Worcester, Cheltenham, Gloucester, &c., and a restaurant car is provided from Bradford and Leeds through to Bournemouth. The 4 p.m. train serves similar districts and a restaurant car is provided between Nottingham and Bath. The 6.35 p.m. train provides a service from Manchester, Buxton, Nottingham, Derby, Burton, Leicester, Birmingham, Droitwich, Worcester, Cheltenham, Gloucester, &c. The 4 p.m. express is an acceleration of the 4.35 p.m. train and does not stop at Templecombe. A connection with Southern Railway trains is therefore provided by running a local train from Evercreech Junction to Templecombe following the express. The 6.35 p.m. from Bath is a new feature. On the return journey express trains for Bath, the Midlands and North of England leave Bournemouth West at 9.50 a.m., 10.20 a.m., 10.45 a.m. and 11.45 a.m.

An interesting development is the running of an express in conjunction with the London Midland and Scottish Railway from Lincoln, Newark, Nottingham, &c., to Bournemouth West, forming the 4 p.m. train from Bath. Another particular feature is the running of a through train from Bournemouth West (11.5 a.m.) to Burnham-on-Sea (giving connections with the Southern Railway via Templecombe), Glastonbury, Wells, Bridgwater and Highbridge. Also to Weston-super-Mare via Highbridge. In the reverse direction a through train leaves Burnham-on-Sea at 11.35 a.m. for Bournemouth West, with connections from Weston-super-Mare, via Highbridge, Bridgwater, Wells, Glastonbury and Templecombe.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition* (1923) *of this standard railway reference work is on sale at* 5*s. net, or by post from the* RAILWAY MAGAZINE *Offices,* 33, *Tothill Street, Westminster, London, S.W.*1, 5*s.* 6*d., Overseas,* 5*s.* 8*d.*

European Signalling.

Mr. C. H. Palmer, whose article on French railway signalling was published in the May number, writes: "These bells (used in Bavaria and Switzerland) signify two things: (1) 'Train entering section' to the station ahead; (2) a warning to all intermediate crossing-keepers to close the barriers for the train. They are also placed at other intermediate points, *e.g.*, gangers' huts, tunnel entrances, etc., where a warning of train approaching would be useful. They are found not only in Bavaria and Switzerland, but can be seen in most countries except Belgium. In France (except on the Nord) their use is confined to single lines. In the first (Lausanne) division of the Swiss Federal Railways, their working is connected in with an old-fashioned block system, the 'Rod' system, which is found nowhere else in the world and which will be superseded shortly."

[Reply to Rev. R. WODEHOUSE.]

Colours of Old Midland Railway Locomotives.

Your query has been submitted to Mr. E. L. Ahrons, who replies that although he cannot state definitely the colours of engines belonging to the railways which were amalgamated to form the Midland Railway Company in 1844, he is under the impression that both the North Midland and Midland Counties engines were painted green, though this statement is not to be accepted as necessarily authentic. Mr. Ahrons writes further, as follows: "The green colour of M.R. engines was definitely changed to red at the end of the summer of 1883—the first one I saw was in October, 1883. But about ten or a dozen engines had been temporarily painted red in 1881, and ran for two years on trial, before the colour was definitely adopted. I remember about half a dozen of them."

[Reply to S. T. COWAN.]

"Super Expresses."

The article to which you refer is another which lends weight to Mr. Allen's strictures on newspaper "facts" concerning railway speeds in his June contribution. Considerable speed developments have been made, but you may rest assured that no start-to-stop runs, or even passing times, will be scheduled at speeds anywhere approaching 80 m.p.h. At the same time, as the "British Locomotive Practice and Performance" articles mention so frequently, *maximum* speeds up to and over 80 m.p.h. are often attained over short distances, and it is even difficult to maintain some schedules, such as the Birmingham two-hour bookings by the

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Great Western Railway route, without their attainment. Mr. Allen hopes to deal with the newspaper cutting you enclose in due course.

[Reply to P. RANSOME-WALLIS.]

Railway Steamers.

We can quite understand the difficulty you have experienced in reconciling various statements as to the tonnages and speeds of individual vessels. In Lloyd's Register particulars such as these have to be interpreted on a specified basis, but for general publicity and for press references it often occurs that other figures, correct according to the point of view, but not necessarily agreeing with those in Lloyd's Register, are adopted. In the new tables of steamers in the 1923 RAILWAY YEAR BOOK an attempt has been made to systematise particulars of steamships on the basis of official information. Consequently, as you point out, the particulars which have been adopted in articles written at various periods may not always agree with those which now appear in the RAILWAY YEAR BOOK.

[Reply to A. S. T.]

Superheater Locomotives.

As we have several times explained, the valves placed immediately behind the chimney of many Great Eastern, Great Northern and other locomotives, is a snifting or release valve, partly for providing relief to the cylinders when running with steam off, but chiefly in connection with the superheater, to allow the escape of steam from the superheater when it is not being used in the cylinders. The valve closes or opens automatically, according to whether the steam pressure is upon it or not. In some superheating systems a special circulating arrangement is included for use when steam is shut off; in other instances a small amount of steam is continuously admitted and is able to escape when relieved by the snifting valve or other appliance.

[Reply to J. G. TURVEY.]

Station Indicators in Trains.

Many years ago a device of this kind was tried on the London, Chatham and Dover Railway. The system used on the Metropolitan District Railway about 25 years ago included series of cards arranged round a spindle and allowed to fall one after the other when released by a ramp alongside the line. To provide for varying routes a number of ramps were provided at junction points, causing cards for the route not required to be released rapidly one after the other to lead up to the series desired. The great trouble with such devices is that a given set of vehicles may need to run on a number of different routes in the course of one day's duty. An electrical appliance was recently tried on the Great Northern and City section of the Metropolitan Railway.

[Reply to G. T. MOODY.]

Continental Expresses.

In view of the fact that these trains, particularly those bringing passengers from the Continent, are liable to run at various times, a number of alternative workings are usually arranged, so that the staff need only to be advised of the number of the timing in force. As some of these would conflict with other services, advantage is taken of alternative route possibilities, in the case of the South Eastern and Chatham Section of the Southern Railway, so that it is by no means unusual for one or more of the Continental boat trains to travel via Maidstone. In fact, in the past if not at present, there have been instances of certain boat trains regularly scheduled to take this route.

[Reply to " C."]

Main Line Level Crossings.

There are several places where railways of considerable importance cross a main line on the level, but the principal instances where two main lines cross in this fashion are at Retford (Great Northern and Great Central lines) and at Murrow (Midland and Great Northern and Great Northern and Great Eastern lines). Your remarks as to non-electric " Brighton " trains travelling between Balham and the Crystal Palace direct route, duplicate comments made by other readers and referred to in the July number.

[Reply to A. RANSON COWLISHAW.]

Woolwich-built Locomotives.

We understand that two 2-6-0 locomotives bearing " A " numbers, A 35 and we believe A 20, from a series built at Woolwich to the order of the late Govern-

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ment, have been the subject of trials on the South Eastern and Chatham section of the Southern Railway. The design corresponds exactly to that of Mr. Maunsell's two-cylinder 2-6-0 class. No. 822, built at Ashford, is a three-cylinder engine and was recently illustrated and described in the RAILWAY MAGAZINE. Your suggestions are noted.

[Reply to J. F. B.]

Somerset and Dorset Joint Railway.

Your remarks are noted as to the heavy mineral traffic worked by 2-8-0 locomotives. As regards the passenger services it is by no means unusual for the 0-6-0 locomotives to take turns, and presumably the reason they are sometimes seen on express passenger trains is either that they are better able to deal with heavy loads on the severe gradients in places, or that they are taking turns with the regular passenger engines.

[Reply to P. H. S. D.]

Southern Railway Locomotives.

A large proportion of the Bournemouth line expresses on the London and South Western section are now worked by rebuilt and superheated 4-4-0 locomotives, while the "Urie" 4-6-0 engines are principally used between Waterloo and Exeter. The "Drummond" 4-6-0 locomotives still work to some extent on various routes, but they are largely employed, together with the "486" class of "Urie" 4-6-0 engines, for heavy goods traffic.

[Reply to "SOUTHERN."]

London and North Eastern Railway Locomotives.

The North Eastern 4-4-4 tank engines are definitely allocated to passenger service, though the 4-6-2 tank engines are used for both passenger and goods traffic. While a few passenger tank engines on various sections of the London and North Eastern Railway have been painted green, the practice now appears to be to adopt black as the colour for all tank engines, as well as for tender goods classes.

[Reply to E. COPE.]

German Locomotives.

Possibly you have in mind the War Department locomotives, a number of which were loaned and used for a time by various British railway companies. These were, however, constructed in this country. No German locomotives were allocated to Great Britain under the reparation terms, owing to the fact that most of them were built to loading gauges greater than those on British lines and therefore could not be run here.

[Reply to "INTERESTED."]

Plymouth and Dartmoor Railway.

You are correct that part of this system was utilised in the construction of the Yelverton-Princetown line, Great Western Railway. The portion in the immediate vicinity of Plymouth is, however, used by the London and South Western section of the Southern Railway, and the Plymouth and Dartmoor Railway Company is, under the Railways Act, 1921, a "subsidiary" thereof.

[Reply to A. R. THISTLETHWAITE.]

Railway Speeds.

Your question is very vague. Realised speed will naturally depend on scheduled speed, and the latter you can easily ascertain by consulting the time-tables of the railway you mention; maximum and minimum speeds on the journey are governed by the grading of the route. Similarly water and coal consumption will be proportional to the scheduled speed.

[Reply to "CENTRALIAN."]

Passenger Engines on Goods Trains.

It is by no means unusual for even the principal express classes to be scheduled to work goods or stopping trains in one direction, in order to obtain a suitable balancing duty without involving overtime. Frequently, too, goods turns are included in the regular duties of a given link of engines. Express goods trains are quite usually worked by passenger engines.

[Reply to "REDGAUNTLET."]

Painting of Locomotives.

The information given in the RAILWAY YEAR BOOK is as ordinarily stated. We note that you describe the lining of late London and North Western locomotives as including an outer band, about ¾-in. broad, of a green-grey colour, edged on the inner side by a narrow strip of yellow, and, about 1½ in. inward, a thin lining of red.

[Reply to BRIAN BRAMALL.]

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London and South Western Plymouth Lines.

You are correct in pointing out that the Stonehouse Pool station and the running of express trains to Waterloo in connection with trans-Atlantic liners was inaugurated in 1904, and not 1909 as stated. Such services are not now operated, as you remark.

[Reply to R. N. MICKLEWOOD.]

London & North Eastern Railway Tank Engines.

We have already pointed out that although some of the passenger tank engines have been painted green, the general practice appears now to be to adopt black with gold letters and numerals, as in the case of the goods engines. See particularly page 52 of the July number.

[Reply to H. S. HACK.]

Banking Locomotives.

There are several instances where, to avoid having to stop trains at the summit of a bank, an assisting engine in rear is provided with a slip coupling, so that it can be detached while moving. Special rules are in force covering the operation of assisting engines on severe gradients.

[Reply to G. W. SPINK.]

Double Regulator Handles.

Mr. Malcolm M. Niven points out that the double regulator handle is very old. It was used by Mr. Patrick Stirling on the Glasgow and South Western Railway. Mr. Manson's regulator, controlling a double-beat valve in the dome, was also arranged for dual operation.

[Further reply to A. E. FORREST.]

Records of Train Running.

Your request, together with suggestions made by other readers in regard to trains which they would like to see recorded by Mr. Cecil J. Allen, has been passed on to him, and no doubt, in due course, and as an opportunity arises, many of these will receive attention.

[Reply to P. E. HIRST and W. G. DAVISON.]

Altered Signalling at Hadley Wood.

To permit of the closing of Hadley Wood and Mimms signal boxes, the signalling through Hadley Wood, on the Great Northern main line, has been altered as necessary. There are, however, no automatic signals as you suggest, nor are there any special features.

[Reply to V.B.]

Tractive Force.

Adapting the standard formula as given in the July number, for a three-cylinder engine multiply by $\frac{3}{2}$, and for a four-cylinder engine by $\frac{4}{3}$, if non-compound. In the case of a compound locomotive, after adapting for the number of cylinders multiply by $\frac{2}{3}$.

[Reply to A. N. L. MACLACHLAN.]

London & North Eastern (Great Central Section) 4-4-0 Engines.

Engine shown in space No. 6 in the frontispiece plate of the June issue, was the first of the "Director" class engines, but the framing over the driving wheels was altered almost immediately after construction to the appearance which is now familiar.

[Reply to P. RANSOME-WALLIS.]

London & North Eastern (North Eastern Section) 4-4-0 No. 1619.

This engine has been referred to frequently in these columns. It was originally one of the two-cylinder 4-4-0 Worsdell-von-Borries compounds of Class "M," but was subsequently converted to a three-cylinder Smith compound, and is still so running.

[Reply to H. T. WICKINGS.]

2-8-0 Tank Engines, Great Western Railway.

Most of these are used in South Wales, but a number are to be found distributed about the remainder of the system, though we are not aware of any at sheds in the neighbourhood of Reading.

[Reply to "REDGAUNTLET."]

Locomotive Performance.

We cannot answer queries as to notable performances made by any particular locomotive. Records of numerous runs by the Great Western 4-6-0 engines have been given in our pages. Please consult back issues.

[Reply to "Loco."]

London Midland and Scottish (North Western Section) Locomotives.

A number of engines on this railway have recently been fitted with small lubricators mounted about the centre-

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line of the boiler, and this is doubtless the "tank" to which you refer.

[Reply to "CUMBRIAN."]

London and South Western Tank Engines.

There are necessarily several classes of these. Dimensions cannot, therefore, be given, though in earlier issues of the RAILWAY MAGAZINE many of these have been illustrated and described.

[Reply to B. Y. WILLIAMS.]

Southern Railway ("Brighton" Section) 4-6-2 Tanks.

No further engines of this class were constructed after the original Nos. 325 and 326, as the more successful 4-6-4 type was then evolved, and has since become standard for the heaviest work.

[Reply to C. THOMPSON.]

"Piccadilly" Line, London Electric Railway.

At the southern or western end this line comes to the surface near Baron's Court station, Metropolitan District Railway, and continues alongside to the Hammersmith terminus.

[Reply to "V. W. O."]

Caledonian Locomotives.

4-6-0 engine No. 938 is one of a series built by Hawthorn, Leslie and Company for service on the Highland Railway, but taken over by the Caledonian Company. The class is generally used for goods traffic.

[Reply to C. G. C.]

South Eastern & Chatham Electrification.

We understand that work has actually been commenced, but for a period this must be more in the nature of preliminary measures, and it may be some time before evidences of any magnitude become visible.

[Reply to H. A. POPER.]

Locomotives at Ashford Works.

We have no definite information as to the use of "Brighton" 0-4-2 tank engine at Ashford Works, but transfers of this kind are to be expected as the effects of grouping become more and more manifest.

[Reply to L. G. PEGRUM.]

Joint Railways.

For the time being, these lines retain their old titles, though it is probable that, in due course, new titles applicable to the present companies concerned will be adopted.

[Reply to N. JACKLING.]

Central Junction Railway.

We have no information as to this term being applied in connection with the Stratford and Moreton Tramway. Possibly some of our historian readers may be able to throw some light on this project.

[Reply to G. W. BISHOP.]

Midland "Single" Locomotives.

Mr. E. L. P. Quested, of Margate, mentions that he recently noticed two of these engines at Lincoln (Midland) station, engaged in working ordinary passenger trains.

[Further reply to E. HUXTON.]

Minor Railways.

For particulars of rolling-stock, &c., in regard to small railways, including the Kent and East Sussex and East Kent lines, see RAILWAY YEAR BOOK, of which the 1923 edition is on sale.

[Reply to "V. W. O."]

Out-of-Course Stops.

Your correction is noted that, in reference to the 3.15 p.m. train from Bognor, our contributor was in error in referring to the route between Horsham and Three Bridges as single line.

[Reply to T. W. SNASHALL.]

Rail Lengths on French Railways.

The usual length of rails on the Chemin de Fer du Nord is 18 metres, though, particularly on sections rebuilt since the war, other rail lengths are used to some extent.

[Reply to H. C. WALLACE.]

Non-Stop Running on Late Midland Railway.

Allowance for the St. Pancras–Shipley run of the pre-war 11.50 a.m. Glasgow summer express from St. Pancras was 243 min. for the 206 miles.

[Reply to J. O. RYMER.]

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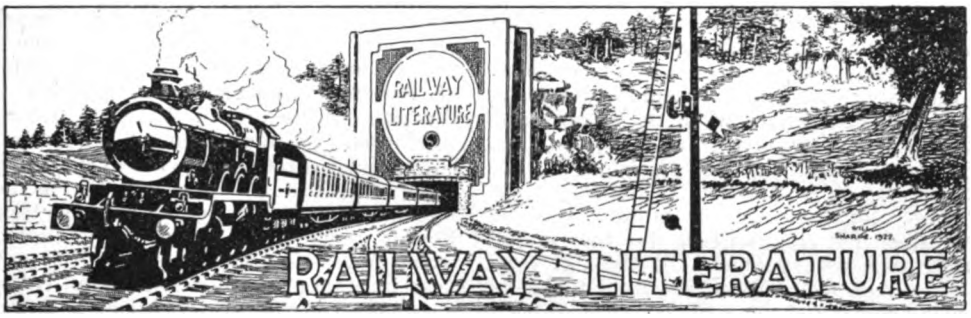

TIMOTHY HACKWORTH AND THE LOCOMOTIVE. By Robert Young, M.I.Mech.E. [Locomotive Publishing Company, Ltd. Price 21s. net.]

As an addition to the numerous, though still very incomplete works which have been published dealing with personages associated with or concerned with specific phases of locomotive and railway development, this volume will be cordially welcomed by a wide circle of readers, and we can unhesitatingly advise its addition to the library of all interested in locomotive and railway matters, both historically and technically. It is well-produced, freely illustrated, including many drawings and photographic reproductions which are far from generally known, and as an example of completeness of research, chapter and verse being given on a very exhaustive basis, this volume will be regarded very highly. It is, however, very distinctly tinged with bias in favour of Timothy Hackworth, though the author infers that earlier historians have been biased in favour of the Stephensons. As, however, Mr. Young supports his claims on behalf of Timothy Hackworth very substantially, it will be no easy matter for other authorities who may differ from him to support alternative views. Undoubtedly, Hackworth has to be credited with a very large share in early locomotive development and with having played an important part in the evolution of railway engineering and operation; but this is, we believe, generally admitted. It is only in irresponsible circles that Hackworth is overlooked, due to the fact that *Locomotion*, No. 1 engine on the first public railway to be opened for traffic, the Stockton and Darlington Railway, and the *Rocket*, necessarily brought the name of George Stephenson so prominently to the fore, in conjunction with his subsequent work as a railway constructor as well as a locomotive builder, that his name is remembered by the ordinary public and press, and Hackworth is only known to a limited extent. The fact that a great deal of Hackworth's work was in association with the Stephensons must also be borne in mind in explaining the lack of public recognition. Much useful data and information are included, while the portraits and references to personalities of the period render this volume the most complete record of the work of Timothy Hackworth and his period yet published.

HOW TO REFORM OUR RAILWAYS. By J. G. B. Sams. [Selwyn & Blount Ltd., 21, York Buildings, Adelphi, London, W.C.2. Price 1s. net.]

In this little booklet of 63 pages the author, who had lengthy experience in responsible positions on the London and North Western and Great Eastern Railways, discusses the railway problems of to-day, and advances a number of suggestions and ideas. To some extent the volume has the usual failing of works of its class—that under the guise of authoritative criticism it actually presents merely the author's ideas. Thus, whereas Mr. Sams advocates various measures, makes certain criticisms, and advances suggestions, many of them involve aspects of railway operation which must already have been given full and careful consideration, while frequently other factors neutralise the value of proposals such as those now advanced. For example, Mr. Sams discusses organisations based on Operating and Commercial Departments, the placing of all engineering sections under one engineer (civil, mechanical, electrical, &c.), whether the stores should not be under the engineer, as the largest purchasing department, and so on. Yet we have recollections of arguments in favour of methods the reverse of some of those Mr. Sams advocates, and supporting schemes on lines with which he would not agree, and expounded with equal if not greater authority and competence. Similarly, it is no use arguing that on light traffic lines a 13 or 14-hour spread-over day would produce economies, until that becomes a practicable proposition. Therefore, while Mr. Sams' ideas and suggestions are pre-

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sented soberly and on the basis of experience and practical knowledge, he must be prepared for strong differences of opinion. Furthermore, where is the point in advocating grouping alternatives when the whole question is practically settled, at least, we hope, for many years to come? Road and aerial transport under the ægis of railway companies, common-user of railway wagons, are other matters discussed, but they are all associated with problems of the day, and do not require Mr. Sams' advocacy to ensure their adoption.

A number of good suggestions of a more incidental and probably practical nature are advanced, and we can certainly recommend a close study of this little booklet, though we may disagree with some of its conclusions and suggestions. We appreciate the acknowledgments to the RAILWAY YEAR BOOK appearing in several places.

THE COLLEGE TRAINED ENGINEER. By Frederic Bacon, M.A. (Cantab.), A.M.Inst. C.E., M.I.Mech.E., M.I.E.E., Professor of Engineering, University College of Swansea. [W. Heffer and Sons, Ltd., Cambridge. Price 6d. net.]

This pamphlet, which is prefaced by a foreword supplied by Sir Henry Fowler, K.B.E., Wh.Ex., M.Inst.C.E., M.I.Mech.E., Deputy Chief Mechanical Engineer, London Midland and Scottish Railway, is a reprint of a presidential address given at the inaugural meeting of the University College of Swansea Engineering Association of Students of the South Wales Institute of Engineers. It was given as far back as November 4, 1921, but in view of the interest it created, and for other reasons, is now published for general circulation. Sir Henry Fowler remarks that his own education would have been much better had he had a year in a shop between school and college, an arrangement which is strongly advocated by Professor Bacon. Both Sir Henry Fowler and the author emphasises very strongly the fact that a college-trained engineer requires systematic practical training to render his studies of any real use. The address throughout provides much food for thought, and not the least valuable feature of this reprint is the inclusion, here and there, of comments made by other engineers at the time the address was given, together with some remarks of a kindred nature from other sources. Professor Bacon passes some pertinent comments upon the attitude of engineering firms and of shop workers to the college-trained man, and as to the desirability of engineers acquainting themselves with, if not qualifying in regard to, commercial aspects of the business with which they are or may be associated.

MINERAL TRAFFIC ON THE LONDON AND NORTH EASTERN RAILWAY.

Photo. NORTH EASTERN 0-8-0 LOCOMOTIVE No. 901, CLASS T3. [*W. Rogerson.*

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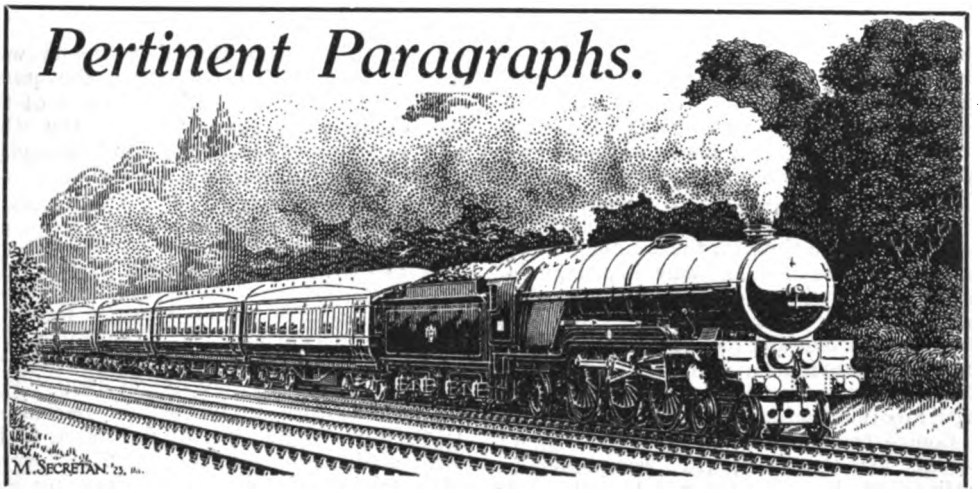
Pertinent Paragraphs.



Railway Officers Visit the Eskdale Railway.

ON June 15, representatives of British main line railways, who were in conference at the Furness Abbey Hotel, took the opportunity of visiting the Eskdale narrow-gauge railway, on the invitation of Mr. R. P. Mitchell, Secretary and General Manager. The party arrived at Ravenglass station at 2.15 p.m., where a special train of narrow-gauge rolling-stock was waiting to convey them up the Eskdale Valley to Dalegarth. In view of the inclement weather, both open and covered cars were provided, and, owing to the very greasy condition of the rails, the train was provided with two " Pacific " type locomotives, the pilot being *Colossus*, built by Messrs. Bassett-Lowke, Ltd., of Northampton. After a little delay, which was occasioned by the visitors making their way along the train to inspect the locomotives, the " right away " was given and the journey of over six miles up the Eskdale Valley commenced. Rain was now making itself very evident, which did not improve the condition of the rails, but, in spite of this the locomotives made an excellent start with their heavy train. In a very short space of time they warmed to their work, and the ascent was made in fine style. Gradients of 1 in 50, and even as much as 1 in 33, were tackled in a remarkable manner.

A halt was made at Murthwaite to inspect the stone-crushing plant recently erected there by Mr. Henry Greenly. Whilst the inspection was in progress, the train was shunted to a siding, which operation gave a clear road to an excursion train booked to leave Ravenglass shortly after the special. The journey was then continued, and on reaching Dalegarth, the present terminus of the line, the party was entertained to tea. At 4.35 p.m. the return journey was embarked upon, the run being accomplished non-stop to Ravenglass. On detraining it was discovered that an important despatch case had been left at Dalegarth, whereupon Mr. Mitchell at once offered to run a special to recover this cumbersome but nevertheless necessary article.

An " Eskdale " Special.

MR. C. COURTICE, to whom we are indebted for these particulars, then describes a run with this special, with which he was allowed to " try the road," there being no passenger traffic about at the time. " The locomotive was of the ' Atlantic ' type, built by Messrs. Bassett-Lowke, Ltd., in 1913, for use at the Geneva Exhibition. Having previously made the journey up and down the line several times as a passenger, I had already gained some idea of the difficult nature of the road, but it was not until actually handling the regulator that I realised how difficult it was to keep the train at an even speed. The actual driving was a grand experience for any locomotive enthusiast, and while I have had the good fortune to ride on the footplate of several well-known expresses, this real driving of this miniature train surpassed all. On reaching Dalegarth, the real purpose of the train's journey had completely left my head! But as Mr. Harding, Mr. Mitchell's assistant, had travelled on the train, he soon had the despatch case on board."

Further Reductions in Railway Charges.

As from July 1, the following reductions came into effect :—The rates for perishables reduced from 75 to 50 per cent. over pre-war figures. Among the articles affected may be mentioned live poultry for consumption, plants and flowers, bread, laver bread, confectionery, cakes, condensed milk, ice-

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cream, &c. The rates for other perishable food-stuffs were reduced by the same amount on January 1 last.

The arrangement under which live-stock returned unsold from shows was charged at half-rates, was extended to poultry, pigeons, rabbits, guinea-pigs and dogs.

The arrangement under which tickets at single fare and a third for the double journey, minimum adult fare 1s., were issued (under the usual conditions) to persons attending annual or periodical conferences is now extended to business meetings and political meetings, provided a minimum number of 200 passengers travel by rail in connection with any one event.

Compartments are now reserved without charge for theatrical, &c., companies in ordinary trains provided not less than six tickets are taken for each compartment. Commencing with the summer issue, the sale price of the railway companies' large time tables has been reduced from 6d. to 3d., and the pocket or sectional time-tables from 3d. to 1d.

An Early Rail Motor Car.

As indicated in "The Why and the Wherefore" section last month, several readers have written in regard to the description of Mr. William Bridges Adams's early rail motor car, illustrated in the May number. In some instances, readers have gone to the trouble of sending lengthy descriptions of this and other cars built in the 'forties of last century, but Mr. W. H. Robson adds some remarks in regard to the *Fairfield* (which, as pointed out last month, ran upon the Bristol and Exeter Railway and not upon the Eastern Counties system) which may be quoted. "My grandfather was one of the earliest Great Western Railway engine drivers, and drove the opening train on the Tiverton branch, also worked it with the Great Western Railway single-wheel engines *Fire-King*, *Venus* and *Vulcan*, as well as the *Fairfield*. About 1849 to 1850 he took the *Fairfield* to Weston-super-Mare Junction and opened the branch from there to Weston-super-Mare, where he was afterwards stationed for a year or so. My father and his brother, when schoolboys, used to amuse themselves by driving the *Fairfield* about the station yard, both at Tiverton and Weston-super-Mare and, at the latter place, in 1851, during their father's absence in London visiting the Great Exhibition, they drove the *Fairfield* through the end wall of the locomotive stores, breaking one of the coupling rods, which my grandfather temporarily replaced with a wooden one made from one of the poles used for driving the pump which supplied the locomotive department with water. The motive power for the pump was obtained by connecting one end of the pole to the pump gearing, and to the other end was attached a horse, which travelled on a circular path around the well."

Some Further Recollections.

REFERRING to the retirement of Mr. J. G. Robinson, for so long Chief Mechanical Engineer of the Great Central Railway, Mr. Robson continues: "I remember him firing to my father on the Great Western Railway engine No. 159, about 1879. This engine was turned out new in December, 1878, and was the first of the batch to be completed. She was of the 2–2–2 type, with driving wheels 7 ft. in diameter and cylinders 18 in. × 24 in. There were ten of this type constructed at the time, and they were very handsome engines, also splendid runners. They were then known as the 'Sharpies,' but, I think, during the latter part of their existence, as the 'Cobhams.' I remember my father saying that he found the bridle-rod of the reversing gear of this engine buckling when running at a high speed; the bridle-rod ran along under the footplate, inside the wheels, so was out of sight from the footplate when running, but he was led to the trouble by the irregularity of the exhaust-beat. The bridle-rod was replaced by a stiffer one, and I notice this trouble is now generally guarded against by fitting a steadying bracket at the middle of the length of the rod."

In conclusion, Mr. Robson adds a few up-to-date remarks in regard to modern train running on the Great Western Railway, upon a personal basis, as follows:—"My brother drives engine No. 2918 on the Great Western Railway, and I travelled behind him from Bristol to London on June 1, with the 12 o'clock from Bristol. We made a very good run, leaving Bristol exactly on time with a load of nine coaches, passed Swindon at 12.46½, Didcot 1.7½, Reading 1.22, Slough 1.37½, and arrived at Paddington at 1.56½, with a check near Westbourne Park. The average speed from Swindon to Slough was 69·7 m.p.h., of course not an unusually high speed for this train, but what interested me was the uniformity of the speed between these points, the average between Swindon and Didcot having been 69.3, between Didcot and Reading 70.3, and between Reading and Slough 69.6. A few seconds earlier in the passing time through Didcot would have put the averages of the three stages equal. If the engine had been fitted with an automatic speed control it could hardly have improved on the above."

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Notes on French Railways.

MR. H. LANGFORD LEWIS sends a few remarks based upon his observations while travelling between Havre and Paris. "No one who took any interest in railways could fail to observe the now large proportion of high capacity rolling-stock in the sidings and on goods trains—30 and 40-ton bogie wagons, mostly labelled 'Etat' or 'Nord,' and used not only together, but sandwiched between four-wheeled wagons, also much larger than we have in England. The big cars in use in France are built on American models, only smaller. The train from Havre to Paris was comfortable, but very full between Rouen and Paris, and was drawn by a big 4-6-2, at a good speed. The line was well laid, much like English track. But suddenly, a short distance west of Rouen, where the Dieppe line comes up, the motion of the train became smoother, quieter and more flexible, with an absence of the emphatic jolt of the bogie over rail joints. I looked out to find the cause, and discovered it at once; flat-bottomed rails had taken the place of the B.H. type we had had so far. After Rouen the B.H. type was resumed, except for a few miles, but I saw a third track being laid, of F.B. rails. It was a most valuable contrast, and the difference in smoothness and quietness was most marked. . . . I believe the only drawback to their use is that the sleepers have to be spaced more closely together. One never sees lines and rolling-stock in France kept in the neat and tidy condition they normally are in England, but the French don't care. A suburban train between Versailles and Paris was neither clean nor comfortable."

Some Comments Thereon.

IN the remarks above quoted, Mr. Lewis passes several strictures upon British practice, though we may point out that the large bogie wagon is not unknown on British lines, while the real issue is not that of large *versus* small wagons, but the operating economies. As will be gathered Mr. Lewis attributes smooth running to the use of flat-bottomed rails. In view of the limited experience which we have of such track in Great Britain, it is difficult to make comparisons on our own account, but it is significant that on the main lines in Ireland the tendency is to adopt the chaired road, and in regard to the few places where flat-bottomed rails are used in Great Britain the opinion always appears to be that chaired track represents improvement and progress. Mr. Lewis suggests that it would be well if one of our big companies would give a fair trial over a stretch of main line to the heavy screw-spiked flat-bottomed rail. As already indicated, there are, or have been, long lengths of main line in Ireland where heavy and fast traffic is worked over F.B. track, particularly on the Great Northern and Great Southern and Western Railways, and these, we should consider, would provide sufficient experience. Moreover, this is a subject which is always receiving attention and is frequently discussed where permanent way problems are under consideration. But it is quite a common thing to find railway officers from the Colonies and from other lands expressing a wish that they were able to adopt British methods and standards of permanent way construction. To what extent this preference is due to maintenance questions we cannot say. It may be that the use of flat-bottomed rails carried directly upon the sleepers lessens the noticeable effects when passing over rail joints, and thus may conduce to greater ease of running but, in other respects, unless flat-bottomed rail track is very solidly built, as would be the case on American and Continental main routes (when its cost is virtually the same as that of a chaired road), the balance of opinion appears to be that the British type of track is to be preferred.

British and French Restaurant Cars.

Mr. Lewis continues as follow:—"Returning from Paris to Havre, we had an excellent dinner on the train for 10 francs a head (3s. 6d. at present rates), the only quickly served meal I had in France. The soup was served, not in plates, but in large, well-incurved china cups, so that we could eat (or drink) it comfortably. The operation of consuming soup on an English dining car at full speed is an irritating one; it swishes round and overlaps the plate before you can swallow it. 'They order,' said Sterne, 'these matters better in France,' And I agree with him. They think things out in that logical country."

With regard to meals on restaurant cars, while the charges mentioned by Mr. Lewis, appear very moderate when expressed on an English basis, it does not follow that the cost is regarded in the same way by residents in France who have to live on the basis of the current monetary values. Obviously there is no reason why soup should not be served in cups in British railway trains, as is sometimes done in hotels here, and we pass on his suggestion as one to which the chiefs of our restaurant car departments might give consideration.

The Finsbury Park Traffic Problem.

ALTHOUGH the House of Commons, when dealing recently with the London and North Eastern Railway Bill; was not concerned with the Finsbury Park traffic problem at all, the Bill relating to matters

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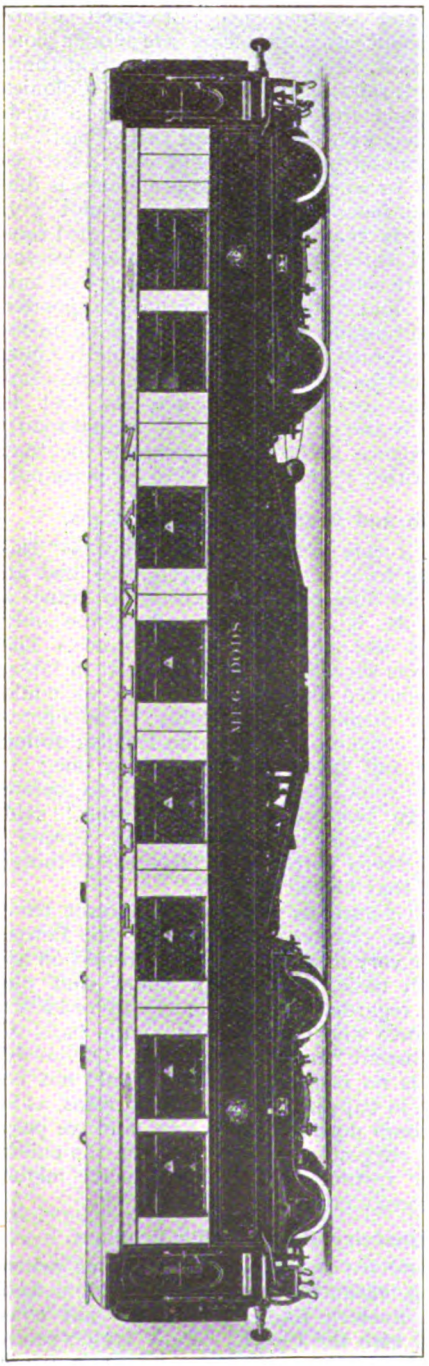
affecting the North Eastern area, members who are anxious for a tube railway extension northwards from Finsbury Park called for the insertion of a clause repealing a section of the Great Northern and City Railway Act, 1902, which prevents the "City" Company from promoting any extension beyond Finsbury Park without the consent of the Great Northern Company. It was pointed out, however, by the Parliamentary Secretary to the Ministry of Transport that there was nothing to prevent an extension by agreement, and that the London and North Eastern Company was now negotiating both with the Metropolitan Company and the "Underground" Company to see what could be done to improve the facilities of travel in North London. Mr. Murrough Wilson also informed the House that the amalgamated company had only been in existence six months, and that three months ago the directors appointed a small committee to go into the whole question of the electrification of suburban areas.



FIRST-CLASS PULLMAN DINING CAR "MEG DODS." ONE OF THREE RECENTLY PLACED IN SERVICE ON THE CALEDONIAN SECTION OF THE LONDON MIDLAND AND SCOTTISH RAILWAY.

The Tube Railways and L. & N.E. Interests.

THE Great Northern and City line, now part of the Metropolitan system, was originally projected with a view to ultimate extension beyond Finsbury Park so as to provide a route for through trains from the Great Northern system to Moorgate Street, and for that reason this tube line was made sufficiently large to take full-sized rolling-stock. That aspect of the scheme did not mature, but it involved an association of Great Northern interests, which renders the embargo upon independent extension into Great Northern territory quite reasonable. In fact, neither Great Northern and City nor the "Piccadilly" section of the London Electric Railway could have been made without the co-operation of the Great Northern Company. Moreover, in association with tramways and motor omnibuses, the construction of these lines has certainly attracted a considerable amount of traffic from the main-line railways serving the locality. Some of this traffic is, perhaps, beyond the capacity of the surface railways, at busy periods at any rate, but the abstraction applies also to other times. Admitting that the Great Northern traffic problem is one of the most difficult there is, it is not clear that the construction of tube extensions would solve the problem, though it might ameliorate it. Several tube extensions have been proposed, and in our April issue some suggestions on these lines were set forth, but constructional costs are still very high, and electrification of the Great Northern lines is a more pertinent remedy, and it is welcome news that that is under consideration.

Indexing Railway Stations.

NOTHING can be more exasperating to the traveller with not a moment to spare who, when consulting a time table for trains, say to New Southgate, upon turning that place

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up reads "New Southgate, *see* Southgate New." This might be allowable if there were a station called Southgate or Old Southgate, but there is neither. If the *A.B.C.* always adopted the same system, the habitual users of the time table would get used to it and expect to find West Brompton under Brompton West, although we imagine 999 people out of a thousand would expect to find it under West Brompton, the only other Brompton now with a railway station so named being a small village in Yorkshire. New Barnet is not indexed under "N" at all, so that a person knowing the station by name would be non-plussed. If one turns up South Kensington the reference is "*see* Kensington South," but it is obvious that people seeking out South Kensington are not concerned with Kensington High Street or Kensington West and, therefore, expect to find South Kensington under "S." Again, when looking for Hartlepool, we are confronted with "*see* West Hartlepool," which is given under "W." New Tredegar is found under "N" with Tredegar under "T," but to find New Beckenham we are referred to "Beckenham, New."

In the indices of the railway companies' time tables, the places are given under the exact name of the station. This is obviously correct. At the same time it might be well, when a station is given under two letters, to give the pages of the time table at each entry, instead of giving the particulars under one heading, and referring to it, under the other as "East Budleigh," *see* "Budleigh East."*

In the index of the late London and North Western Railway time tables, there is Croydon (*see* East Croydon) occupying two lines. Under East Croydon the entry is "East Croydon 16, 75." If the Croydon entry read "Croydon 16, 75" it would give the information at once without turning up another page, and save a line of type as well. The services to and from Croydon comprise one local train and the "Sunny South Special." Travellers residing on the late London and North Western Railway requiring information about the Croydon train service are much more likely to look for Croydon than East Croydon.

When the late South Eastern and Chatham Railway came into being, upon the working arrangement between the South Eastern and London Chatham and Dover Railways, which provided two stations in many towns, the wise plan was adopted of adding the distinguishing word to the name of the town, instead of prefixing it. This ensured that the various stations in a town would be indexed together—thus Canterbury West would appear after Canterbury South, which would not have been the case had the stations been named "South Canterbury" and "West Canterbury."

* This example of indexing is from the A.B.C., to which the pagination remark does not apply. The late London and South Western Railway indexed it only under E.

No Southern Railway Trains at Moorgate.

By a recent decision of the Chancery Court, a 42-years' old statutory agreement between the late London, Chatham and Dover Railway and the Metropolitan Railway was terminated. Under this agreement the Metropolitan Railway provided the connecting spur, 14 chains in length, between Snow Hill (more recently called Holborn Low Level) and the "Widened Lines," west of Aldersgate, together with platform and other accommodation at Moorgate Street, for the use of the London, Chatham and Dover Railway trains. The cost was about £30,000. The London, Chatham and Dover Railway, in return, agreed to run 80 trains a day to, and 80 from, Moorgate Street (with a minimum of six per hour each way), to pay a mileage proportion of the receipts to the Metropolitan Railway, and, in lieu of rent for the use of Moorgate Street Station, to pay ½d. per passenger, on each ticket, both up and down, between Moorgate Street and stations to Walworth Road, 1d. for stations beyond Walworth Road less than 15 miles distant, and 2d. each for those beyond. For return tickets 50 per cent. was added. The service was commenced September 1, 1871, but at first only 50 trains a day were run by the London, Chatham and Dover Railway. Part of the Moorgate Street service was provided by diverting to it those London, Chatham and Dover local trains which previously terminated at and started from Farringdon Street. The service was never well patronised by the public, and although the London, Chatham and Dover Railway could have determined the arrangement in 1881 by paying the Metropolitan Railway £30,000, it did not do so. The number of trains was reduced, and in 1916 Government control and war curtailments gave the South Eastern and Chatham Railway (as successors to the London, Chatham and Dover Railway) the opportunity of discontinuing the service. In May, 1922, the Metropolitan Railway gave the South Eastern and Chatham Railway notice to reinstate the service, but it did not do so. The Metropolitan Railway then brought the action to determine the agreement and to obtain payment of money claimed under it. The Southern Railway Company defended, as electrification and future developments may possibly render a resumption of the

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service desirable, and there were legal aspects requiring settlement. The Judge, however, decided against the Southern Railway, stating that the Metropolitan Railway was entitled to a declaration that the agreement was at an end, and ordered an inquiry, if necessary, as to damages.

Train Running in the United States and in the British Isles.

MR. ERIC CRICKMAY, writing from New York, mentions that recently he had occasion to travel to Atlantic City, a section of the route including the famous "galloping ground" between Camden and Absecon. The train was a through express from the Pennsylvania station, New York, and the load six steel cars hauled by 4-4-2 engine No. 51. Via the cut-offs used, the distance is 143·8 miles, and the schedule 3 hr. 10 min., including five stops. From Elizabeth to Trenton, 42·6 miles were run in 43 min., start to stop, while on the section from Haddonfield to Absecon, included in the route of the famous Philadelphia-Atlantic City "flyers," the passing time for 45·3 miles was 44½ min. Mr. Crickmay mentions that, when doing about 65 m.p.h., a Central Railroad of New Jersey train on a parallel track "passed us almost standing still!" He estimates that the train must have been making over 80 m.p.h.

Incidentally, Mr. Crickmay (who has plainly kept up his connection with the "old country") points out, in reference to recent excursion arrangements on our own Great Western Railway, that certain trains had unusual non-stop runs. Thus, the 2.12 p.m. excursion from Paddington on March 29 was booked from Reading, depart 3.4 p.m., to Starcross, via Westbury, due 6.15 p.m. On the same day, the 11 p.m. ex Paddington ran from Reading (11.50 p.m.) to Totnes, arriving 3.55 a.m. Also on the same day, the 8.25 a.m. ex Paddington was scheduled from Reading to Newton Abbot in 3 hr. 4 min. Mr. Crickmay also recalls runs from Paddington to Newport, non-stop in 2 hr. 25 min., and the occasional booking of the down "Cornish Riviera" express, when in two portions, to run to Devonport, instead of North Road, Plymouth, in the case of the first section. Most of these instances of special traffic working have been referred to in our pages at various times, but in view of present day developments in train working it is interesting to recall them.

Special Traffic Working on United States Railways.

MR. CRICKMAY also sends a cutting describing the special traffic arrangements in connection with the Dempsey-Gibbons prize fight at Shelby on July 4. The cutting is based on an interview with Mr. E. H. Wilde, General Passenger Agent of the Great Northern Railway, U.S.A. Apparently, this event was expected to attract passenger traffic on a very wide basis, and the principal work of the railways was to deal with special trains in all directions, the local traffic being left chiefly to the tramways and local systems. It was estimated that at least 700 cars would have to be accommodated, or about 60 trains. The empties for many of these were stored at Cutbank, the division terminal, some 25 miles west of Shelby, thus freeing Shelby of the need for providing accommodation. The great problem was, of course, the return traffic, and the arrangements provided for a 30-minute headway for all special trains on each route. Special measures were taken to familiarise passengers with the locations, numbers and train times of their specials. Some 200 additional staff were transferred to Shelby, where the platforms were lengthened and space allocated to the special traffic, the ordinary station being largely reserved for regular traffic.

In view of the work done by British railways in connection with special events such as the "Derby" and "Grand National" race traffics, &c., the arrangements described do not appear exceptional. As, however, most of the trains concerned involved journeys of from 9 to 33 hours, requiring sleeping and restaurant cars and other equipment, the special character of the problems to be solved will be gathered. Obviously, too, these arrangements were in addition to obligations of a more local character, which necessarily had to be met on a considerable scale.

Alternative Routes on the old L. & Y.R.

THE old Lancashire and Yorkshire Railway was probably easily first in the number of Y or triangular junctions, if such junctions be based on the total mileage of the system, whilst the absorption of previously independent lines and the construction of loops and avoiding lines, gave the system alternative routes between most important centres on the system. Joint ownership with the London and North Western Railway of lines added further to the diversity of routes possible; these have been increased by the inclusion of both systems in one group. When there are several routes, the various services between important towns are usually confined to one, though sometimes non-stop trains take different routes from those adopted when one or more calls have to be made *en route*. Bury has three routes from Manchester—through Clifton, Prestwich and Middleton

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Junction, but in this case frequent services are provided by each route. Junctions south of Wigan, particularly approaching Bamfurlong, rival those at Clapham (London) in number and intricacy, although the former relate to the lines of one railway only—the late London and North Western—whilst at Clapham, several railways are (or rather were) concerned.

So numerous are Y junctions on the late Lancashire and Yorkshire system that it has been said that every important town on it, not on a " dead-end " branch, can be reached by leaving either end of Victoria Station, Manchester, without the train having to reverse *en route*. If this be true, the circle trains would have many more routes than the late " inner," " middle " and " outer " routes of the London local lines. As a result of the grouping it would be interesting to learn the greatest distance a train could travel from Victoria station, Manchester, leaving at one end and arriving back at the other, without reversing, or passing off the metals of the London Midland and Scottish Railway, or joint lines and not travelling over the same lines twice. Probably a more northern or southern railway centre on the system than Manchester would give a longer circular journey.

Communication between Passenger and Guard.

A BURNLEY reader asks for some information concerning the introduction of passenger and guard communication devices on English railways, and whether the companies introduced it voluntarily. The necessity for a method of communication between passenger and guard became apparent as soon as railways became the recognised means of transport. Numerous methods were suggested, including speaking tubes, looking-glasses, and guns ! Many different ways of utilising a cord outside the carriage were suggested. Two, by railwaymen, contained the germ of the ideas that were subsequently embraced by most railways, and remained in use with various improvements until, between 1902 and 1909, practically all British railways had adopted the present form, whereby the automatic brake is partially applied, its application, if not controlled by the driver, bringing the train to a standstill. Mr. J. K. Williams, Superintendent of the Bristol and Birmingham Railway, is credited in 1845 with having proposed the plan which caused a bell in a portable box placed on the coach next the engine to ring when the communication cord was pulled. In 1847 Mr. Grimshaw, Station Superintendent at Bishopsgate, Eastern Counties Railway, elaborated the method. The cord was wound on a roller in the rear brake van and the other end attached to the spring of an alarm bell in the front van. Pulling the cord from the direction in which the train was running released the spring, thus causing the alarm bell to sound. Mr. W. B. Adams took up this method, and, to work it efficiently, introduced the type of brake van having a raised look-out in the roof. In 1852 and 1853 Committees were appointed by the Railway Clearing House to look into the subject, but nothing definite was done. Several railways fitted a train tentatively with some system or another, electrical communication being tried on certain lines. The Great Western and the London, Brighton and South Coast Railways sought to solve the problem by the provision of a " travelling porter " on the tender, whose duty was to look out for signals from the guard or passengers, and transmit them to the engine driver. The murder of a passenger in a North London Railway train by a German in July, 1864, brought the matter to a climax. Public agitation increased and was insistent. In 1865 a Committee of General Managers was appointed to consider the subject. The public was invited to submit proposals, and 196 suggestions were received. As a result of the agitation, in 1868 the Regulations of Railways Act made it obligatory upon railways to provide a means of communication between passenger and guard. The statute only applied when trains ran over 20 miles without stopping. The fitting of an apparatus for the purpose could, therefore, be avoided by any railway by stopping its passenger trains at 20-mile intervals. To the South Eastern Railway and the London, Brighton and South Coast Railways belong the honour of fitting their trains with efficient electrical communication, the other railways usually fitting some variant or another of the cord system.

London Railway History.

A LONDON newspaper, originally an evening journal, but now a morning paper, commenting upon the plans for demolishing Charing Cross station, states :—" It may be of interest to add that there is already in existence a strip of land connecting the South Eastern and Chatham Railway with the London and South Western, built by special command of Queen Victoria for the convenience of Napoleon III, when that monarch was on a visit to this country." The connecting spur referred to was removed a few years ago in connection with the reconstruction of the terminus. A portion of the connecting line remains and is used as a siding for dealing with milk and other transfers to and from the South Eastern and

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Chatham and London and South Western sections of the Southern Railway. We do not know the source of the *Westminster Gazette's* "Napoleon III" myth. The Act of 1859, authorising the construction of the Charing Cross Railway from London Bridge, included the construction of the junction with the then London and South Western Railway at Waterloo.

Railway "Hostlers."

EVERYBODY knows that as railways and railway equipment were designed to supersede roads and road vehicles, the names generally used for the road, its vehicles, &c., were applied to railways, *i.e.*, iron horse = locomotive; coach = railway car; to stable = to put away after work. Another application of a coaching name to railway working frequently used in America is the term "hostler," to describe the men who take charge of the locomotive when in the shed for cleaning, firing up, &c. A hostler is the man at an inn who feeds, cleans, &c., coach horses and performs other duties which are carried out by grooms when the horses are stabled at the owner's premises. If it be desirable to continue the application of horse terms to railway working, "hostler" appears to be well chosen for the locomotive duties performed by the men in question.

The Fastest Train in the British Isles.

OUR frontispiece this month reproduces a photograph, taken by Mr. F. E. Mackay, of the inaugural run, on July 9, of the 2.30 p.m. express from Cheltenham, which, as announced last month, is now booked to cover the distance of 77 miles 24 chains from Swindon to Paddington in 75 minutes. The train in question is thus accelerated by 10 minutes, and now takes pride of place as having the fastest start-to-stop schedule on any British railway. Hitherto, the honours in this connection have had to be shared by the North Eastern and Great Central sections of the London and North Eastern Railway, the former's 8.59 p.m. from Darlington to York being booked to cover the 44·1 miles in 43 minutes, and the latter's 4.30 a.m. from Leicester to Arkwright Street, Nottingham, 22·6 miles in 22 minutes, both giving averages of 61·5 m.p.h. The new Great Western schedule involves an average speed of 61·8 m.p.h., and for a considerably greater distance. Upon the inaugural run the train was worked by two-cylinder 4–6–0 locomotive, No. 2915, *Saint Bartholomew*. It consisted of nine standard main line vehicles, so that the load would not be much below 300 tons. Owing to a severe permanent way repair delay near Wantage Road the 24 miles from Swindon to Didcot occupied 24¾ minutes. Thence to Southall, sectional average speeds of from 69 to 77 m.p.h. were involved, but by then the train was well before time, so that the remainder of the journey was taken relatively easily, though even then the arrival was approximately three minutes early. The following table sets forth principal details, as supplied by a correspondent :—

	Distance from London.	Booked timings.	Actual timings.	Actual average speed on inaugural run.
	Miles.	p.m.	p.m.	Miles.
Swindon (dep.)...	77¼	3.45	3.45	
				58
Didcot (pass.) ...	53¼	4.9	4.9¾	
				77
Reading ,, ...	36	4.25	4.23½	
				75
Twyford ,, ...	31	4 30	4.27½	
				70½
Maidenhead (pass.)	24¼	4.35½	4.33	
				72½
Slough (pass) ...	18½	4.40½	4.37¾	
				69
Southall ,, ...	9	4.49	4.46	
				49
Paddington (arr.)	—	5.0	4.57	

Chief Locomotive Inspector Flewellen travelled on the footplate, with Driver P. Hopkins and Fireman F. Bailey.

The Acton-Cricklewood Branch of the Midland Railway.

Referring to Mr. Millar's article, published in the June number, several readers have written pointing out that, in the summer of 1910, a through train was run from the Midland system to Dover and Southampton utilising this section. The train stopped at Hendon, where a South Eastern & Chatham Railway tank engine worked the Dover portion, *via* Kentish Town and the Metropolitan Railway, to Herne Hill, while a London & South Western locomotive took on the Southampton portion *via* the loop at Brent sidings, and thence *via* the Cricklewood-Acton line, Acton Wells Junction, Gunnersbury, Richmond, Virginia Water and Chertsey, to the main line at Byfleet Junction. Admitting that advisedly this service might have been referred to, Mr. Millar explains, however, that he was concerned more particularly with train services, whereas the through train mentioned merely utilised the line, as in the case of goods and mineral trains which still work regularly over it, there being no traffic actually associated with the branch.

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It has been decided by the directors of the London and North Eastern Railway to appoint an Industrial Agent whose aim will be to encourage traders to start new industries and to open new works on the system. The services of the new officer will be placed at the disposal of either public bodies or private firms who are looking round for opportunities of developing fresh business. The directors have selected for the new post an old North Eastern man in the person of Mr. S. T. Burgoyne, M.V.O., O.B.E. Before the war, Mr. Burgoyne, after a thorough training in goods work, filled confidential positions at York. In May, 1915, he went to the Ministry of Munitions as Personal Assistant to Sir Eric Geddes. In August, 1916, he was made Deputy Assistant Director-General of Transportation, with rank of Captain, R.E. In the following year he went to the Admiralty as Private Secretary to the First Lord with the rank of Commander, R.N.V.R. After the armistice, Mr. Burgoyne joined the staff of the Ministry of Transport, and is now giving up an appointment in the Finance and Statistical Department at the Ministry to return to railway work.

MR. S. T. BURGOYNE, M.V.O.,
Industrial Agent,
London & North Eastern Railway.

* * *

Included in the King's birthday honours, but not announced until the end of June, were several conferred upon directors and others connected with the railway industry. The list contained the following :—

Baron.—The Hon. Charles Napier Lawrence ; Chairman, London Midland and Scottish Railway ; Chairman, Antofagasta (Chili) and Bolivia Railway ; Chairman, Chilian Northern Railway ; Director, Argentine Great Western Railway.

Baronets.—Sir William Plender, G.B.E., J.P. ; Member, Railways Amalgamation Tribunal. Mr. John Henry Brunel Noble, M.A. ; Director, London and North Eastern Railway.

G.B.E.—Sir William Guy Granet ; Deputy-Chairman, London Midland and Scottish Railway ; Director, Central Argentine Railway.

K.B.E. (Civil Division).—Mr. Percy Crosland Tempest, C.B.E. On January 1, 1923, appointed one of the three General Managers of the Southern Railway.

* * *

Mr. Joseph Tatlow has been elected Chairman, and Mr. Richard Pim Deputy-Chairman, of the Dublin and Kingstown Railway. As Mr. Tatlow states in his book, "Fifty Years of Railway Life," the Dublin and Kingstown has the distinction of being the first railway constructed in Ireland. Opened as far back as 1834, it was amongst the earliest of the railway lines in the British Isles, its only predecessors being the Stockton and Darlington (1825), the Manchester and Liverpool (1830), and the Dundee and Newtyle (1831).

* * *

On the occasion of Mr. Harry Willmott's retirement from active railway life as the result of grouping, Lord Willoughby de Broke entertained him at dinner at the Great

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Eastern Hotel. Among the railway friends of Mr. Willmott present were Lord Faringdon, Sir George Beharrell, Sir Sam Fay, Messrs. Sidney Herbert, Ludford Docker, W. J. Stevens, J. Bischoff, A. Lawford and L. Sydney-Smith. As chairman or director, Mr. Willmott was associated with the Sheffield District Railway, the Stratford-upon-Avon and Midland Junction, and the Isle of Wight Central, while in his younger days he was an officer of the Great Eastern Railway.

* * *

On the Prince of Wales' birthday, in glorious weather, the fifth annual sports of the Metropolitan Railway Athletic Association were held at Wembley Park on the fine recreation ground of 13 acres provided by the company adjoining the station. In addition to about 3,000 members of the staff and their friends, there were present :—Lord Aberconway, P.C. (Chairman of the company); Hon. Evelyn Hubbard, Sir Harry Verney, A. I. Belisha and Mr. J. W. Wheeler-Bennett, C.B.E., Directors; Mr. R. H. Selbie, C.B.E., General Manager (Referee); Mr. E. A. Wilson, Engineer; Mr. C. Jones, Chief Electrical and Mechanical Engineer; Mr. W. Holt, Traffic Manager; Mr. J. Wardle, Commercial Manager; Mr. F. Dawson (Chief Clerk of the Course); Mr. H. Gibson, Estate Agents; Mr. H. S. Stewart, Assistant to the General Manager, and others. Also Mr. A. R. Garside, a former Assistant General Manager; Mr. R. H. Nicholls, C.B.E., Superintendent of the Line, Great Western Railway; Messrs. S. J. Webb, J. Thornton and W. S. Every, "Underground" Railways. In presenting the prizes, Lord Aberconway congratulated the Metropolitan Athletic Railway Association in that Mr. J. Wilson had carried off the one-mile and the second prize in the half mile London Railways Athletic Association Championships, while Mr. Butcher had made the highest possible score on the range, bulls'-eyes every time. He also expressed his pleasure at the great success of the meeting as a whole, upwards of 400 entries, justified by prizes valued at over £100. Arrangements were in the hands of a committee, of which Mr. W. Holt is Chairman, and Mr. R. E. A. Merrifield Secretary, and of the Sports Executive Committee, Mr. T. Wilding, Chairman, and Messrs. F. Dawson, J. A. Willis and W. Challis, Joint Secretaries. During the proceedings the Great Central and Metropolitan Silver Prize Band, under Mr. W. Smith, rendered selections, also providing the music for the dancing in the evening after the sports.

* * *

On Saturday, July 7, the annual convention of the Permanent Way Institution was opened at Liverpool. A civic reception was extended to the delegates by the Lord Mayor at the Town Hall. The annual meeting was held at the Exchange Station Hotel, the president (Mr. E. A. Wilson, Chief Engineer of the Metropolitan Railway) being in the chair. The annual report showed that the Institution was in a prosperous condition with a membership of 1,800. During this week the delegates had an interesting programme to carry through, including visits to the docks, Chester, Preston and other centres. Among the signalling installations inspected were the automatic points and signals on the Mersey Railway, and the daylight signals on the Liverpool Overhead Railway.

* * *

To what extent aerial transport, either for civil or military purposes, will supersede or supplement land transport, is necessarily a question which only the future can answer, but the Royal Air Force Pageant on Saturday, June 30, at Hendon, indicated very markedly the high degree of reliability and competence which aeroplane engineering has already reached, besides suggesting many possibilities which will materially influence transport ideas in years to come. Obviously, on that occasion, the spectacular element was strongly to the fore, in which connection the organisers of the pageant are to be congratulated upon the splendid selection of events and the close punctuality and absence of delays or hitches in carrying out the ambitious programme arranged. But the racing events constituted real tests of speed capacity; the "aerobatics" of machine manipulation, ability to meet emergencies and manœuvring possibilities, both singly and by several machines working together; the parade of more or less novel machines showed recent development; and the "warfare" events indicated how aerial transport has revolutionised the entire military situation, both offensive and defensive. It was, however, as indicating progress in transport that the pageant was most illuminating. By means of man-carrying aeroplanes as many as 25 men could be carried by one machine, complete with fighting equipment; and this at speeds obviously impossible by land or water transport, and requiring no allowance for the natural difficulties and dangers of land or water transport in places where such eventualities are most likely to occur. Land (motor and rail) transport has solved some of the world's transportation problems; water transport meets the needs in other cases; but aerial transport opens up still wider possibilities. War applications differ greatly from those of civil transport by air, but every develop-

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ment in one field may prove of value in the other. Mention may also be made of the very satisfactory way in which the tremendous crowds attending the pageant were conveyed by rail, omnibus, tramcar and private motor car and cycle.

* * *

IN the new London "Underground" Electric railway cars now on order the motormen's compartments will be fitted with unsplinterable glass windows. "Triplex" glass, as it is called, is composed of two sheets of glass, between which a thin sheet of transparent celluloid is interposed. The whole is then subjected to a pressure of 100 tons to the square inch, the result producing a glass which will crack but will not splinter. In all future orders for "Underground" rolling-stock this glass will be employed, so that, in the event of anything striking the motormen's windows, even with considerable force, the risk of accident through flying splinters of glass will be eliminated.

* * *

ON Saturdays, from July 14, the Southern Railway provides a service from Charing Cross to Ramsgate Town in 118 minutes. The distance is 88 miles. The through coaches are attached to the 1 p.m. Charing Cross–Folkestone train and slipped at Ashford (arrive 2.5, dep. 2.13) and reach Ramsgate Town 2.58 p.m., a stop being made at Canterbury West at 2.33. The train is continued to Margate Sands, arriving at 3.11 p.m. This is the quickest service provided over this route to Thanet for the past 40 years, but does not equal the "Granville" of 1877, which made the non-stop journey, Cannon Street to Ramsgate, 87 miles in 105 minutes.

* * *

A SPECIAL TRAIN conveying the Directors and chief officers of the Great Western Railway ran non-stop from Paddington to Weymouth on July 6. The journey of 154½ miles was performed in 2 hours 55 minutes. This is the time that was suggested, but not put in operation, by Sir Sam Fay for the old London and South Western Railway accelerations introduced in 1899. The distance by the Southern Railway is 143 miles.

* * *

REARRANGEMENT of the signalling at King's Cross Terminus, London and North Eastern Railway, as described in the RAILWAY MAGAZINE for March last, allows the departure platforms to be used for arrivals. The up Leeds express, due at 1.55 p.m., recently arrived at the main departure platform (No. 10), the 4–6–2 locomotive, No. 1471, *Sir Frederick Banbury*, running right up to the buffer stops. The arrival was necessarily a few minutes late, as No. 10 platform had been in use for the 1.50 p.m. down Scarboro' express.

* * *

FOLLOWING a visit to France, Mr. J. Macartney Robbins writes:—

"I would like to draw your attention to a few new trains which have made their appearance lately:

"(1) 14.15 Paris (Nord) to Bruxelles (Midi) due 18.00, at an average speed of 52 m.p.h. The train is non-stop. Customs examination of hand baggage is carried out on the train. The train is strictly limited, and only passengers who book seats previously are allowed to travel by it. On the day I saw it leave the Nord Station in Paris it was composed as under:—

"Locomotive No. 31,161, 4–6–2, of La Chapelle Shed.
"First-class brake corridor.
"First-class corridor.
"First-class corridor.
"Second-class corridor.
"Second-class corridor.
"First-class corridor brake

"The train was very well loaded. I understand, from a conversation I had with a railway official, that the Nord engine works the train through to Bruxelles and returns next day with the 14.15 ex Bruxelles Midi, due Paris 18.00. These Pacific engines have been supplied with large bogie tenders so as to carry a sufficient water supply.

"(2) 18.00 Calais to Bale via Amiens, Laon, Chalons-sur-Marne, Belfort. Restaurant and sleeping car provided. The return train, however, runs to Boulogne instead of Calais. This service connects with the 14.00 out of Victoria.

"On Saturday mornings there is a train, Boulogne to Bâle, connecting with the Friday night service Victoria to Paris via Dover and Boulogne. The return train leaves Bâle on Sundays."

* * *

A HIGHLY-CREDITABLE production is the *Official Holiday Guide* of the Southern Railway (South Western Section) for 1923. It does much more for the potential holiday-maker than is suggested by its title, "Hints for Holidays," for it provides excellent maps and charming illustrations both in colour and in black and white, particulars of luggage arrangements, long lists of hotels, boarding establishments and holiday lodgings, to say nothing of the well-written descriptive matter and general information concerning the many holiday haunts in the south and west of England and the Channel Islands served by the train and boat services of the well-managed railway system

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that emanates from Waterloo. The book in question has a wonderful post-war record. In 1918 it consisted of only 48 pages. In the following year eight pages were added, and in 1920 and 1921 the pages numbered 72. Last year there were 108, and the present issue for 1923 contains no fewer than 168 pages, 10 maps, 16 coloured views, nearly 150 photographic reproductions, and references to about 300 places that offer rest and recreation. The holiday haunts described range from great and popular resorts like Bournemouth and Ilfracombe to peaceful retreats such as Barton-on-Sea, St. Enodoc, Saunton Sands and Sark. Conveniently arranged in sections according to counties, &c., and possessing a carefully-compiled index, the guide contains a mass of such information as is required by those desirous of planning a well thought-out and successful holiday. The book is on sale at the railway stations, price 6d., or it may be obtained by post, 9d., from the Publicity Department, Waterloo Railway Station, London, S.E.1.

* * *

BEARING the title "Trade, Travel and the Great Western Railway," a booklet of 26 pages, 7½ in. × 5 in., well illustrated and attractively produced, is being distributed by the railway company concerned. Although intended for the use of the trader, the pamphlet contains a vast amount of information of value to the railway student and of interest to the ordinary traveller. Among the facts it furnishes concerning the Great Western Railway the following may be mentioned :—

Total mileage of railway track	8,287
Number of stations and halts ..	1,500
Number of docks and harbours owned by Great Western Railway	20
Number of docks and harbours served by Great Western Railway	40
Coal shipping hoists	190
Number of passengers carried per annum	170,000,000
Merchandise and mineral tonnage per annum	60,000,000
Number of locomotives ..	3,979
Number of passengers and goods vehicles..	110,339
Longest non-stop run in the world, Paddington to Plymouth ..	226 miles
Water area of the principal Great Western Railway docks—	
Cardiff	165 acres
Newport	135 ,,
Barry	114 ,,
Port Talbot	88 ,,
Penarth	81 ,,

* * *

THERE is no taste in holiday making that may not be met and satisfied in one or the other of the resorts served by the 7,000 miles of line owned by the London and North Eastern Railway. All the same, great credit is due to the Advertising Manager for the admirable selection he has made for the purposes of the newly-issued book entitled "Holiday Suggestions." It contains over 60 illustrations in photogravure of holiday resorts in England and Scotland with a brief description of each. There is also a series of 19 booklets, each describing a particular holiday district, well illustrated and containing a map of the territory concerned. Three editions of the Company's Lodgings and Hotels Guide, dealing respectively with the Eastern Counties, North Eastern Counties and Scotland, have been issued. Copies of any of these publications can be obtained at any London and North Eastern Railway Office or from the Passenger Manager, Liverpool Street Station, London, E.C.2.

* * *

ACCIDENTS occur in the movement of railway wagons by capstans, and the following hints are the illustrated subjects of a poster issued by the London "Safety First" Council: (1) Don't put your feet on the treadle to apply the power until you are quite sure that the rope is clear of the treadle and your feet, or any other obstruction. (2) Don't attempt to rectify any fouling of ropes until the power has been taken off and the capstan and wagons brought to a standstill. (3) Don't walk across ropes and particularly those that are in use on moving wagons. (4) Don't leave ropes round a capstan when at rest. Remove the ropes clear of rails and capstan. When ropes are not in use coil them up. Practical suggestions for the prevention of accidents are invited, and should be addressed to the Hon. Secretaries, London "Safety First" Council, 119, Victoria Street, Westminster, S.W.1, from whom may be obtained copies of this poster and others previously issued.

* * *

WHEN the City and South London Railway Bill came before a Select Committee of the House of Lords on July 10, Lord Ashfield explained it was proposed to extend the line from its present southern terminus at Clapham Common for six miles to a junction at Morden with the authorised Wimbledon and Sutton Railway. For the first 4¾ miles the line would be in tube and would rise gradually to the surface at Morden. In opposition to the Bill evidence was given by Sir Herbert Walker and Sir William Forbes. Eventually, on July 11, the committee rejected the proposals.

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A STRIKING event in the construction of the new Underground Line from Golder's Green to Edgware took place recently at Golder's Green, when huge girders to carry a bridge across Elmcroft Crescent were put into position. Between Golder's Green and Hendon the line passes through a considerably developed area. This has necessitated an immense amount of viaduct work (5,100 ft.) and the crossing of many thoroughfares. Altogether, 12 steel girder and brick bridges have to be constructed. At Elmcroft Crescent two girders, 129½ and 111 ft. long, totalling 104 tons in weight, now span the roadway. The method in lifting these monsters is noteworthy. Rails carrying a movable trolley are laid upon the road surface. The girder is then pushed by an engine until it rests upon the top of the trolley. The trolley with the girder upon it then gradually advances across the road until the opposite side is reached and the girder comes to rest upon the brick pier ready to receive it. The height of the bridge itself at Elmcroft Crescent will be 10 ft. by 28 ft. wide. Two hundred tons of concrete and 250 tons of steel work will be used in its construction, bringing the total weight of the completed bridge up to 450 tons.

* * *

A PHOTOGRAPH, reproduced on this page, shows the Webb three-cylinder locomotive *Greater Britain* at Northampton, Castle station, on one of its earliest trips between Crewe and London. This engine, as will be remembered, was the prototype of its class and was used for several years for hauling express passenger trains on the London and North Western Railway main line. At the time of its appearance it created a great deal of interest, particularly on account of its long boiler and special wheel arrangement. The photograph was taken by Mr. F. E. Harris, of Northampton, over 30 years ago, and shows the engine attached to a passenger train leaving Northampton for Euston.

* * *

OUR Crewe correspondent writes: "The first four of a new series of 0–8–4 side tank shunters are now in hand, *i.e.*, Nos. 468, 792 793 and 1904. With regard to the preceding batch, the last five engines are fitted with Ramsbottom safety valves, not 'Pop' safety valves, as stated previously on page 507 of the June RAILWAY MAGAZINE. Further 'Claughtons' have been named, as follows: No. 2511 *Croxteth*, No. 192 *Bevere* and No. 2445 *Baltic*. No. 315 *Harrowby* is the latest 'Precursor' class locomotive to be rebuilt with superheater, while the following four-cylinder compound mineral engines have been converted to 'G 1' class; 'B' class Nos. 823, 1288, 2369, 2496, 2556, 2560; 'E' class No. 1585 and 'F' class No. 905. Recent withdrawals include two more of the old 6-ft. curved-link class engines, viz., *Engineer Walsall* and the spare *Engineer.*

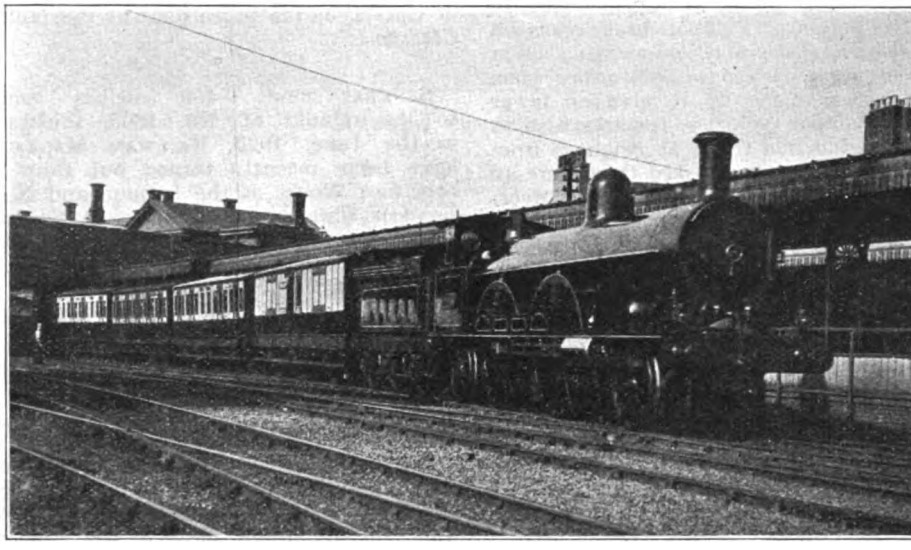

Photo.] [*F. E. Harris.*

THE WEBB THREE-CYLINDER COMPOUND LOCOMOTIVE "GREATER BRITAIN" AT NORTHAMPTON CASTLE STATION ON ONE OF ITS EARLIEST TRIPS TO LONDON.

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These engines have been replaced by the 6-ft. straight link engines formerly No. 609, *The Earl of Chester* and No. 792, *Theorem* respectively. No. 1904, *Rob Roy*, a 'Jubilee' class compound, has also been cut up recently."

* * *

SIR W. G. ARMSTRONG, WHITWORTH AND CO., LTD., have secured an order for 25 heavy main line locomotives for the Buenos Ayres Great Southern Railway. They are intended for goods traffic and are of the 4–8–0 three-cylinder superheated type with double bogie tenders, for a gauge of 5 ft. 6 in. The locomotives are to burn oil and will be built at Newcastle-on-Tyne.

* * *

MR. H. W. POINTER, writing in regard to the introduction of Pullman brake vans on the *Southern Belle*, and commenting upon his observation on a recent Saturday when the train was made up to give no fewer than 11 Pullman vehicles, remarks also in regard to excursion trains at Brighton from other lines. On a recent day there were 10 special excursions, one coming from Wolverhampton, Worcester and Stonehouse, made up of Great Western stock, one from Nuneaton, London and North Western stock, and one from Dartford, South Eastern and Chatham vehicles.

* * *

A SHEFFIELD reader, Mr. L. Sincox, referring to the fact that Great Northern locomotives are now working certain Great Central turns, including those on the late Great Central main line, the engines being in some instances manned by Great Central men, mentions that four Great Northern "Atlantics," Nos. 1420, 1422 and 1433 and one whose number has not been noted, are now stationed at Sheffield. They replace Great Central 4–6–0 locomotives Nos. 1100, 1101, 1102 and 1104.

* * *

MR. O. J. MORRIS states that, in addition to the "Brighton" 4–4–0 engines Nos. 45 and 60, rebuilt in the same fashion as No. 55 (illustrated in the RAILWAY MAGAZINE for November, 1922), Nos. 52 and 70 have been similarly dealt with and are now engaged on the same duties. He recalls that No. 52 was the first engine of class B 4, having been turned out from Brighton Works in December, 1899, when it bore the name *Siemens*. No. 52 was afterwards renamed *Sussex*, thus reviving a name which had been well known in "Brighton" Railway locomotive history, particularly when borne by Mr. Stroudley's rebuild of one of Mr. Craven's 2–2–2 engines in 1871. No. 70 was built by Messrs. Sharp, Stewart and Co., and turned out in September, 1901. It then bore the name *Holyrood* and was famous for the run with the Pullman Limited express on December 21, 1901, when the 51 miles from Victoria to Brighton were covered in 53½ minutes. Under Mr. Marsh, No. 70 became known as *Devonshire*, another famous "Brighton" name, previously borne by No. 209, one of Mr. Stroudley's early 0–4–2's of class D 3, the prototypes of the famous *Gladstones*.

* * *

SEVERAL new 4–4–0 engines similar to the rebuild of No. 1805, illustrated in the June, 1923, RAILWAY MAGAZINE, have been recently turned out from the Stratford Works of the London and North Eastern Railway (Great Eastern Section). The series will be numbered 1780–1789. These engines are being placed in service painted and lettered in the new style.

* * *

THE first fatal accident to a British passenger train this year and the first since that of December 6—eight months previously—at Birkenhead Park, occurred at Diggle, between Huddersfield and Stalybridge, on July 5. A goods train had come through the Standedge tunnels on the up South line, and had been pulled up at Diggle Junction signal-box, clear of the crossover junction from the up North to the up South line. This had been done by a red flag. Through the junction just named the signals were lowered for the passage of an express and just before it arrived the goods train moved forward and fouled the path of the express. This was done in response to the hand-signals of a shunter and after the red flag had been withdrawn, the latter evidently so as not to confuse the enginemen on the express who would pass between the signal-box and the goods train. Two passengers and two railwaymen were killed, and one of the latter was the driver of the goods train.

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GLASGOW CENTRAL STATION.

Notable Railway Stations and their Traffic.

GLASGOW CENTRAL STATION, LONDON MIDLAND AND SCOTTISH RAILWAY.

I.—PASSENGER TRAFFIC ROUTES AND SERVICES.

By CHARLES TRAVIS, M.Inst.T.

THIS station has already received attention in our earlier "Notable Railway Stations" series (RAILWAY MAGAZINE, January, 1907) at the time it was enlarged to its present capacity, while in the November, 1908, number the electro-pneumatic signalling, then newly installed, was described. Glasgow Central station is, however, so well known as the largest and most interesting of the great Scottish terminal stations, while the original article by the late Rev. J. T. Lawrence, M.A., was somewhat general in character, that it is thought that a new article dealing with this famous station and its traffic on a different basis will be in place.

As explained in the earlier article the original portion of the station dates from 1879, when the first bridge over the Clyde was completed. Until then main line trains from the south used Buchanan Street station, travelling via Coatbridge, while other trains terminated at "South Side" (now the goods depôt), and at Bridge Street, just south of the river, the latter site now being utilised as sidings, &c. There were then eight platforms served by the four lines of the original bridge, while 66 trains arrived and 68 departed in the course of the day. In 1889 No. 9 platform was added, and in 1906 the second bridge over the Clyde was built and platforms Nos. 10, 11, 12 and 13 added. In 1890 358 trains were dealt with daily, which number had increased in 1900 to 466, and in 1912 to 527, reducing, however, as a normal total, to 481 in 1922. The low level station, added on August 10, 1896, is of a through type and deals with about 140 trains on an ordinary day.

The station is notable for the width of its principal platforms, its exceptionally spacious circulating area of some 3,000 square yards extent, designed to serve the platforms *in echelon*, so as to obtain

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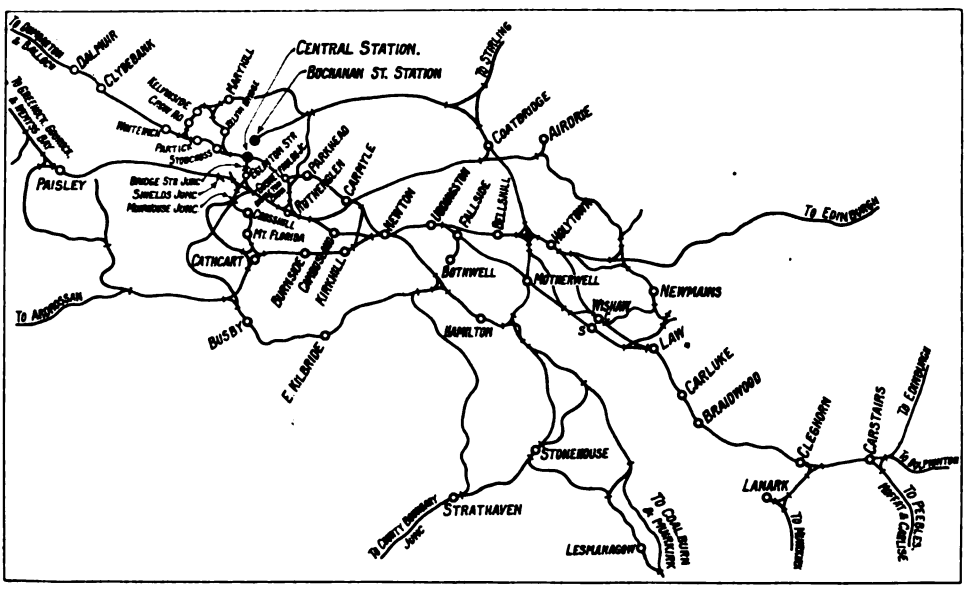
effective passenger distribution, the airy and light interior realised by the roofing scheme, and the remarkable extent and convenience of its underground communications. Total platform length is 2,910 yards. Extreme width is 360 ft. The covered area is 35,278 square yards. Below the main station are the four platforms of the low level line, substantially at right angles to those above, so that, in the aggregate, passengers have the use of 17 platforms, those underground being served by through trains on various suburban routes.

From the traffic aspect, as in other respects, the Central station is the most important of the Glasgow railway stations. There are handled all the express and local trains with England, and with Edinburgh and other towns in Scotland; the heavy coast traffics to Greenock, Gourock, Wemyss Bay and the Clyde coast; the extensive residential and business traffic to outlying districts, and a very large suburban traffic to and from places within a 15-mile radius. In normal times about 500 passenger trains arrive and depart from the Central daily. It is computed that the number of passengers using the station—calculating two journeys per day for each season-ticket holder—exceeds 25 millions per annum.

Based on an average working day of 18½ hours between the first train in the morning and the last train at night, these figures are remarkable and scrutiny makes them even more so. In common with all other stations dealing with a voluminous suburban and residential traffic the business over the working day is somewhat uneven, the rush hours in the morning, at mid-day and in the evening being separated by quiet spells, so that half the trains and a like proportion of the passengers are actually dealt with during the six hours rush. In the busiest hour of an ordinary working day the arriving and departing trains total 80, exclusive of the docking of empty carriages and the shunting of engines for the trains. In working movements the docking and shunting work is equivalent to a further 40 trains. The station, with its extensive distributing area and admirable conveniences, is in every way adapted for dealing with the enormous daily volume of traffic, and it may be noted that, on the occasion of the greatest holiday traffic on record 163,000 passengers were booked at the station in one day, irrespective of those passing through.

It is, however, when the lines leading to the Central station and the traffics passing over them are considered that it is seen



GLASGOW AND DISTRICT LINES.
London Midland and Scottish Railway, Caledonian Section.

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how the effective organisation of the work involved in the handling of a heavy express, local and suburban traffic can be made to get the utmost out of limited existing running lines. The approach lines to the Central are indeed limited. The main line from Carlisle consists of but a double line of rails to Gushetfaulds Junction, four running lines being then available to the Central station—a little over a mile distant. Along the double track from Carlisle to Carstairs passes all the traffic from Carlisle to Edinburgh, Glasgow and the North. At Carstairs the Edinburgh trains branch off, but this occasions no relief, as more trains, some originating at Carstairs, and others at Lanark join the main line at Cleghorn, two miles to the north, and actually result in a greater pressure on the main line on the northern side of Carstairs than on the southern.

The residential traffic affecting Glasgow makes its first appearance at Beattock, 60 miles out, with the 7.28 a.m. from Moffat, better known as "The Tinto Express." This train is an old time Carlisle to Glasgow "parly," converted into a long-distance residential express, and it maintains a fast all-the-year-round service between Moffat, the Upper Clyde, Peebles, Biggar and Glasgow and Edinburgh. It takes up a portion including a Pullman Breakfast Car from Peebles and Biggar at Symington and leaves off the Edinburgh section at Carstairs. A number of regular travellers from the outlying branches and from Carstairs itself join the "Tinto Express," and the earlier trains there, and the regular travellers from Lanark, together with the daily passengers picked up at Braidwood, Carluke and Law Junction, necessitate two residential trains. From Law Junction the two alternative routes to Motherwell and Uddingston are used by the trains best suited to meet local requirements; an additional residential train is added from here and another two from Wishaw, two miles further on, whence there is a very large residential traffic with Motherwell and Glasgow.

The greater number of the trains from Wishaw Central run over the deviation line to Motherwell, while the others go via Holytown and rejoin the main Motherwell to Glasgow line at Uddingston. At Holytown, the residential traffic with Glasgow receives an acquisition in the Edinburgh to Glasgow express and local trains and an influx of city-going passengers from the Newmains branch. The trains running from Carstairs and Lanark via Motherwell are inadequate for the Glasgow traffic emanating at Motherwell, so additional residential trains have to be added from that point, some running via Bellshill along with other trains to meet the demands of that town and others proceding via the main line direct to Uddingston. At Fallside, a mile short thereof, three residential morning trains from Bothwell are added to the now numerous trains making towards Glasgow. The Bothwell trains, and the trains from more distant places running via Motherwell and via Holytown also serve Uddingston, where the daily travellers number many hundreds. At Newton, the next station, there is also a large suburban traffic and the morning group of trains with Glasgow business people is swollen by half-a-dozen from Coalburn, Lesmahagow, Stonehouse, Strathaven and Hamilton. A train or two here is diverted to the Underground line via Carmyle and Parkhead, and to the Cathcart Circle line to serve Kirkhill and Burnside, but in volume the number of trains passing hence to Rutherglen during the rush hours fully taxes the capacity of the one double line. There is also the important suburban station of Cambuslang to serve intermediately, and at this place the season-ticket holders number 1,355, while there is a large volume of ordinary passenger traffic.

The only line joining this busy stretch of track is that from Coatbridge and Airdrie, this converging between Cambuslang and Rutherglen, but with the opening of the Central Underground line the trains between those points and the City were diverted to it, and the passenger trains on this connecting line are now restricted to one early morning train to the north and two late evening trains from the north. At Rutherglen, which is one of the two eastern inlets to the Central Underground Railway, a number of the trains pass on to that line, yet despite this the number continuing on the main line to Eglinton Street and Glasgow Central is sufficient during the busy morning, midday and evening hours to maintain an

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THE CONCOURSE, GLASGOW CENTRAL STATION.

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uninterrupted succession of trains through the section.

The Polmadie engine sheds of the company, at which most of the engines working the trains into and out of the Central are stationed, are situated between Rutherglen and Eglinton Street, and the necessary engine movements add materially to the occupancy of the line, as also does the traffic to the Larkfield carriage sheds, from which point, however, two up and two down lines are available. From Eglinton Street Junction to Bridge Street Junction the main line trains share the four sets of rails with the trains from the Cathcart Circle Railway, Ardrossan, East Kilbride and Burnside and from Bridge Street Junction the ten passenger lines to the Central are also shared with the trains to and from the Gourock and Wemyss Bay section.

The Cathcart Circle Railway consists of an Inner and Outer Circle, with 10 intermediate stations, and, as already mentioned, detaches itself from the main line at Eglinton Street Junction. Like all inner suburban lines it is particularly susceptible to abnormal traffics at the morning, noon and tea hours, there being very quiet spells between the rush periods. The general arrangement is a 15-min. service on both arms of the Circle in the forenoon, afternoon and late evening, with a 10-min. service between 8 a.m. and 10 a.m.; 12 noon and 2 p.m.; and 4 p.m. to 7 p.m. The 10-min. service is, however, augmented by many auxiliary trains at the busy hours of the rush periods —the service at certain times on both Circles being equal to a 3-min. one. The Circle service carries, on the average, 7,000 season-ticket holders, who for the most part make three double journeys daily between their home station and Glasgow Central, and there is also a large number of ordinary passengers.

The Cathcart Circle Railway is subject only to three diverging lines throughout its length. The trains for Burnside and Kirkhill and on to Newton diverge at Mount Florida, and the Ardrossan trains at Cathcart on the Outer Circle, while trains to and from Busby and East Kilbride leave and join the Inner Circle at Muirhouse Junction. The Burnside trains are few in number and a burrowing junction, passing under the Cathcart Circle Railway and used by in-going trains without interference with the Cathcart Circle trains, minimises interruption to the main service. The Ardrossan service never exceeds some 15 regular trains—a steady suburban traffic from the nearer stations comprising the bulk, the war years having retarded the residential development of the highly promising pastoral district further out—and existing services are conveniently arranged to dovetail in with the Circle services proper.

As well as the big daily suburban traffic the Cathcart Circle Railway has to cope with occasional abnormal volumes of traffic, as Mount Florida is the station for Hampden Park, where all the national and international football matches are played. Moreover, Crosshill, the next station, is adjacent to Cathkin Park and the ground of the Third Lanark Football Club. It is somewhat fortunate that, except in the case of the international match between Scotland and England, when the trek of the hundred thousand odd spectators from the city begins at about 11 a.m., the football rush generally does not begin until the ordinary Saturday mid-day migration to the suburbs is over, the one being therefore clear of the other. The big games are also reflected in the traffic on other sections as, in addition to the 34 special trains engaged on the last occasion exclusively in taking the football "fans" between Glasgow (Central) and Mount Florida for important matches, 45 trains from and to the outlying districts were dealt with at other of the Caledonian Glasgow stations. In some instances 30,000 passengers have been dealt with at a local station in four hours.

The third and last of the approaches to Glasgow (Central) is the line from Wemyss Bay, Gourock and Greenock, which joins at Bridge Street Junction, a quarter of a mile out from Central and for convenience in working the trains from and to this section are invariably dealt with at Nos. 13, 12 and 11 platforms. They are thus kept clear of other trains passing to and from the station. On the Gourock and Wemyss Bay section there is a very heavy residential and coast traffic throughout the year—naturally more dense in the summer season—and the remarkable feature is that the flow is much the same in both directions. When the summer

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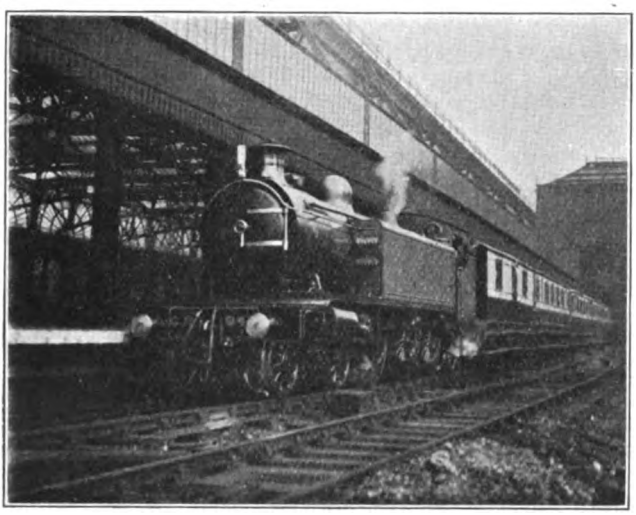
visitors have added their thousands to the regular travellers by the morning trains from the coast termini to the City, the morning travellers to the coast are correspondingly increased by the influx of additional excursionists bound for a day at the several coast resorts, or for the many pleasure sailings on the Firth of Clyde.

The flow of the large inter-town traffic between Glasgow, Paisley and Greenock, which is of regular volume and less susceptible to seasonable influences, is also fairly equally distributed in both



CLYDE COAST EXPRESS IN GLASGOW CENTRAL STATION.

directions. Against a particularly heavy goods and mineral traffic on this section, there are decided working advantages in the fact that four lines are available between Shields Junction and Paisley, and that the level line between Glasgow and Gourock readily admits of fast running with heavy trains, this meaning that fewer trains are required than would be the case on other sections.

At the busy hours the tickets of passengers in many of the trains for Glasgow (Central) are collected on arrival there, this saving the time and occupancy of the lines which calls at the usual ticket collecting stations would involve. This is an important factor in smooth and punctual working, but an even greater one is the careful organisation and arrangement of the services and the careful supervision of every detail of the working between Glasgow (Central) and the points where the trains originate. An intensive system of docking and dealing with the trains at Glasgow (Central) also helps to ensure punctual working. An extract from the platform arrangements notice controlling the working at the station is reproduced on page 175.

All other movements necessitated by extra vehicles in the way of horse-boxes, vans, carriages, &c., are provided for on the same intensive principle, and as the outcome of this and the careful scrutiny of each day's working, the services to and from the Central have a splendid record for punctual train arrivals and departures.

The Central Underground Railway serves many purposes. It relieves the over-burdened main line approach to the High Level station of all the local trains from and to Airdrie, Coatbridge and Bothwell, and a number from and to Hamilton and Motherwell; it furnishes a regular and rapid service from Carmyle and Rutherglen on the east of Glasgow to Partick, Kelvinbridge, Kelvinside and Maryhill on the one hand and to Whiteinch, Clydebank, Dalmuir, Dumbarton and Balloch on the other.

The two lines from the east join at Bridgeton Cross and go through Glasgow Green, Glasgow Cross, Central Low Level, Anderston Cross, Stobcross (where a line goes direct to Maryhill via Kelvinbridge, Botanic Gardens and Kirklee), Partick (Central) to Partick (West). Here the Clydebank, Dumbarton and Balloch trains pass on to the Lanarkshire and Dumbartonshire Railway, and those for Maryhill via Partick proceed there via Crow Road and Kelvinside. The line is under or near the main street of the City running east and west, and is much in use as a speedy means of point to point transit within the City. There is also a large suburban traffic on the line within Glasgow proper and from Airdrie and Coatbridge, Clydebank, Dalmuir, Dumbarton, Balloch and intermediate stations. The service is

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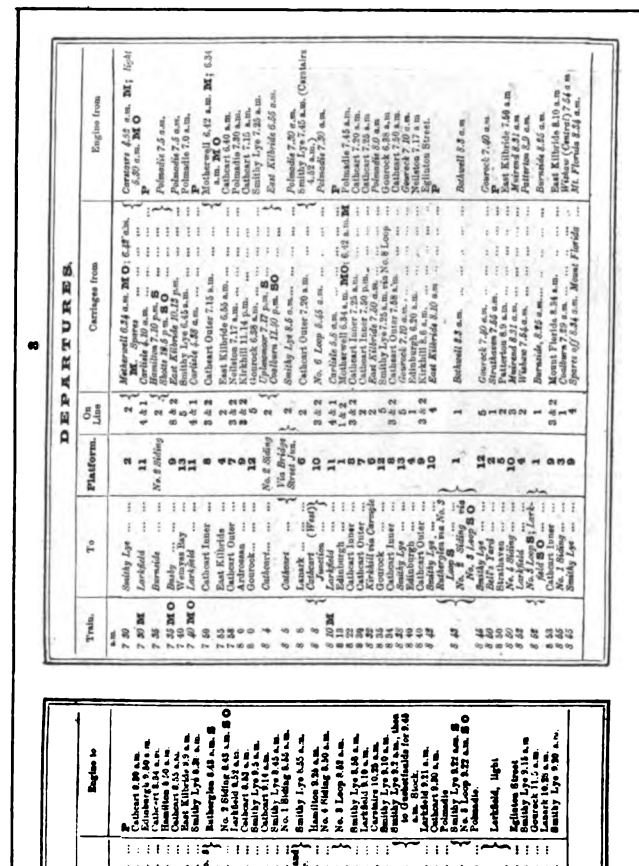

EXTRACT FROM PLATFORM ARRANGEMENTS SCHEDULES, GLASGOW CENTRAL STATION.

arranged so that regular and frequent trains are maintained between Rutherglen and Maryhill, such trains serving the whole underground section, and this service is provided both by local trains originating and terminating at the two points and by trains from and to the outer districts.

The traffic between Glasgow and Clydebank, Dumbarton and Balloch is particularly heavy. The major traffic on this section is workmen's, and under normal conditions as many as 28 trains are required daily, the number of workers conveyed being about 23,000. The stations are all practically next door to the yard gates, and until the adoption of the universal rates for such tickets, the workmen's fares on the cheapest in Great Britain, the workers being conveyed between Rutherglen and Kilbowie, a distance of 10 miles, for 1*s.* per week, and to Dumbarton—17 miles—for 2*s.* per week. The existing fares are, Glasgow and Clydebank, 3*s.* per week, and Glasgow and Dumbarton 4*s.* per week. In the season a heavy holiday traffic is carried by the line to Balloch for Glasgow's new public park there and in connection with the Loch Lomond steamers.

The average number of trains dealt with at Glasgow Central (Low Level) station is about 140 per day.

[A companion article describing the station itself and how traffic is dealt with will be published next month.—Ed. R.M.]

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Photo.] **A BOOSTER-FITTED LOCOMOTIVE HAULING A TRAIN OF EIGHTEEN COACHES.** [*F. E. Mackay.*

L. & N.E.R. (Great Northern Section) 4-4-2 locomotive, No. 1419.

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The Locomotive Booster on the L. & N.E.R.

By G. A. SEKON.

UNFAMILIAR to many readers of the RAILWAY MAGAZINE under its American name of "Locomotive Booster," the traction increaser in various tentative forms, but differing considerably from the booster, was not a complete novelty in British locomotive practice.

The London and North Eastern Railway (Great Northern section), however, has to be credited with the initial fitting of the booster itself to a British locomotive. The engine in question is No. 1419, one of the well-known Atlantic (4-4-2) type of express locomotives of the late Great Northern Railway. The object of the booster, which has been in use for some years in America, is to supply additional power at times when for short distances the ordinary tractive effort of the engine requires augmentation. The severe rise out of King's Cross terminus, ¾ mile at 1 in 105, followed by a mile at 1 in 110—over which heavy trains scheduled at express speed have to be hauled by Great Northern Railway 4-4-2 locomotives—presents an ideal combination for the successful use of the locomotive booster.

The use of the booster converts the trailing wheels of the locomotive into a pair of driving wheels which supply independent and, therefore, augmenting power. The booster is a separate two-cylinder engine placed below the footplate of the locomotive. There are advantages in this system over the six coupled type of engine. Great friction and severe stresses concomitant with the multi-coupled type of engine are reduced, whilst *additional* tractive power is supplied by the independent engine of the booster. This extra power is only applied when circumstances require it, such as on steep gradients, to assist in starting heavy trains from a state of rest, when adverse meteorological conditions prevail, &c., so that the extra demand on the steam-producing capacity of the boiler is merely temporary and can be met without augmentation of the heating surface.

The booster fitted by Mr. H. N. Gresley, the Chief Mechanical Engineer of the London and North Eastern Railway, to Great Northern Railway locomotive No. 1419, located beneath the footplate, is at the rear of the trailing axle (see outline drawing on page 178). To provide sufficient space for the apparatus the frames of the engine have been lengthened at the footplate end. The booster engine has two inside cylinders, 10 in. diameter by 12 in. stroke; the ends of the cylinders can be seen clearly in the photograph reproduced on page 179.

The steam distribution is by piston valves with direct valve motion. On the driving shaft of the booster is a pinion wheel, from which, through an intermediate, or idler pinion wheel, power is supplied to the trailing carrying wheels of the locomotive, through a third pinion wheel fixed on the trailing axle. The three pinion wheels are all of different diameters, so arranged that the revolutions of the trailing carrying wheels are less than those of the driving shaft. The diameter of the carrying wheels driven by the booster is 3 ft. 8 in., consequently the successful application of the booster is dependent upon a comparatively low speed, such as when the train starts, or is climbing a gradient.

The idler gear is secured to the base of the booster by a rocking arm; when it is desired to operate the booster gear, the driver, by means of compressed air apparatus operating a piston attached to a bell crank, throws the idle pinion into mesh and establishes connection between the driving shaft and the carrying wheels. The driver then admits steam to the booster cylinders by means of an air operated regulator, and the booster operates. When steam is cut off from the booster engine, the idler gear is taken out of mesh by means of spring-controlled mechanism, and the trailing axle is thus relieved of the retarding action, which would result from being in engagement with the booster driving apparatus.

The weight on the coupled axles of No. 1419 has been increased; each now

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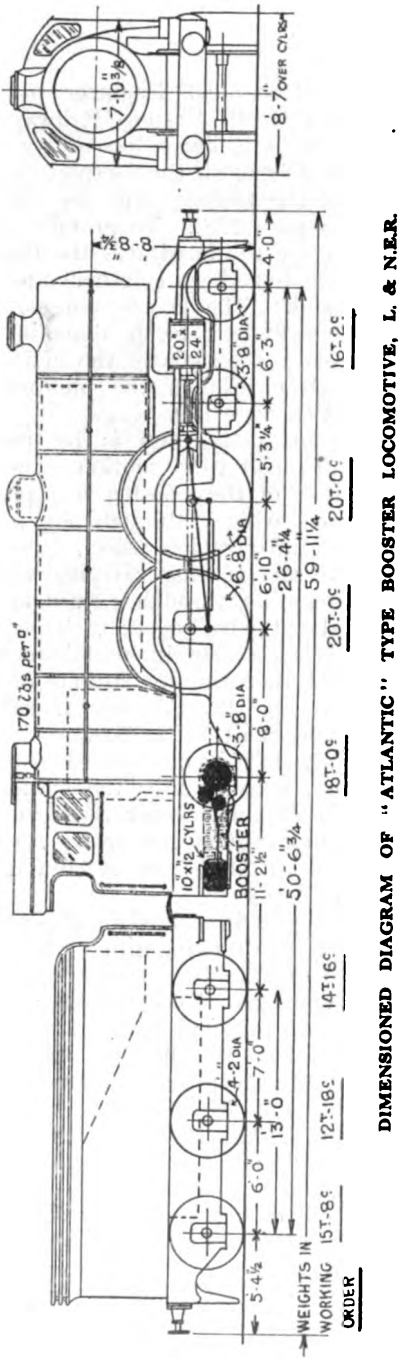
carries 20 tons; the weight on the trailing axle is 18 tons. At 85 per cent. of the boiler pressure, the tractive effort of the 20 in. by 24 in. cylinders is 17,340 lb., and of the booster engine 8,500 lb., so that with the booster in operation the total tractive effort is 25,840 lb., an increase of almost 50 per cent.



DIMENSIONED DIAGRAM OF "ATLANTIC" TYPE BOOSTER LOCOMOTIVE, L. & N.E.R.

In the middle of July an experimental trip was made by No. 1419 with a train of 18 coaches, over heavy grades in the London district, when the advantage of the booster was practically demonstrated by the ease with which the train was hauled up the banks and started from a state of rest. The photograph reproduced on page 176 shows the train on this experimental trip. It will be observed that so far as the booster apparatus is concerned, little difference is made by it in the external appearance of the locomotive—the provision of an air compressor on the smoke box on one side and a live steam pipe along one side, and exhaust pipe on the other side above the running board, are to be seen. Advantage has been taken of the lengthening of the footplate to provide No. 1419 with an improved type of cab having a longer roof and side windows.

The dimensions, weight, &c., of No. 1419 as fitted with the booster are :—

Main cylinders, diameter ..	20 in.
,, ,, piston stroke	24 in.
Wheels, coupled, diameter ..	6 ft. 8 in.
Booster cylinders, diameter	10 in.
,, ,, stroke ..	12 in.
Trailing wheels driven by booster, diameter	3 ft. 8 in.
Wheelbase, rigid	6 ft. 10 in.
,, total engine ..	26 ft. 4¼ in.
Boiler, diameter	5 ft. 6 in.
Heating surface—	
Firebox	141 sq. ft.
Tubes (2 in. diameter) ..	1,121 sq. ft.
Flues (5½ in. diameter) ..	703 sq. ft.
Total evaporative heating surface	1,824 sq. ft.
Superheater surface	568 sq. ft.
Working pressure	170 lb. per sq. in.
Grate area	31 sq. ft.
Boiler h.p.	1,259.
Main cylinder h.p.	1,235.
Weight of engine in working order	74 tons 2 cwt.
Weight of tender in working order	43 tons 2 cwt.
Total weight engine and tender in working order ..	117 tons 4 cwt.

The tender carries 6½ tons of coal and 3,500 gallons of water, and is equipped with water pick-up apparatus.

The booster has added to the weight of the engine only about 3 tons.

The London and North Eastern Railway has no less than 241 tender loco-

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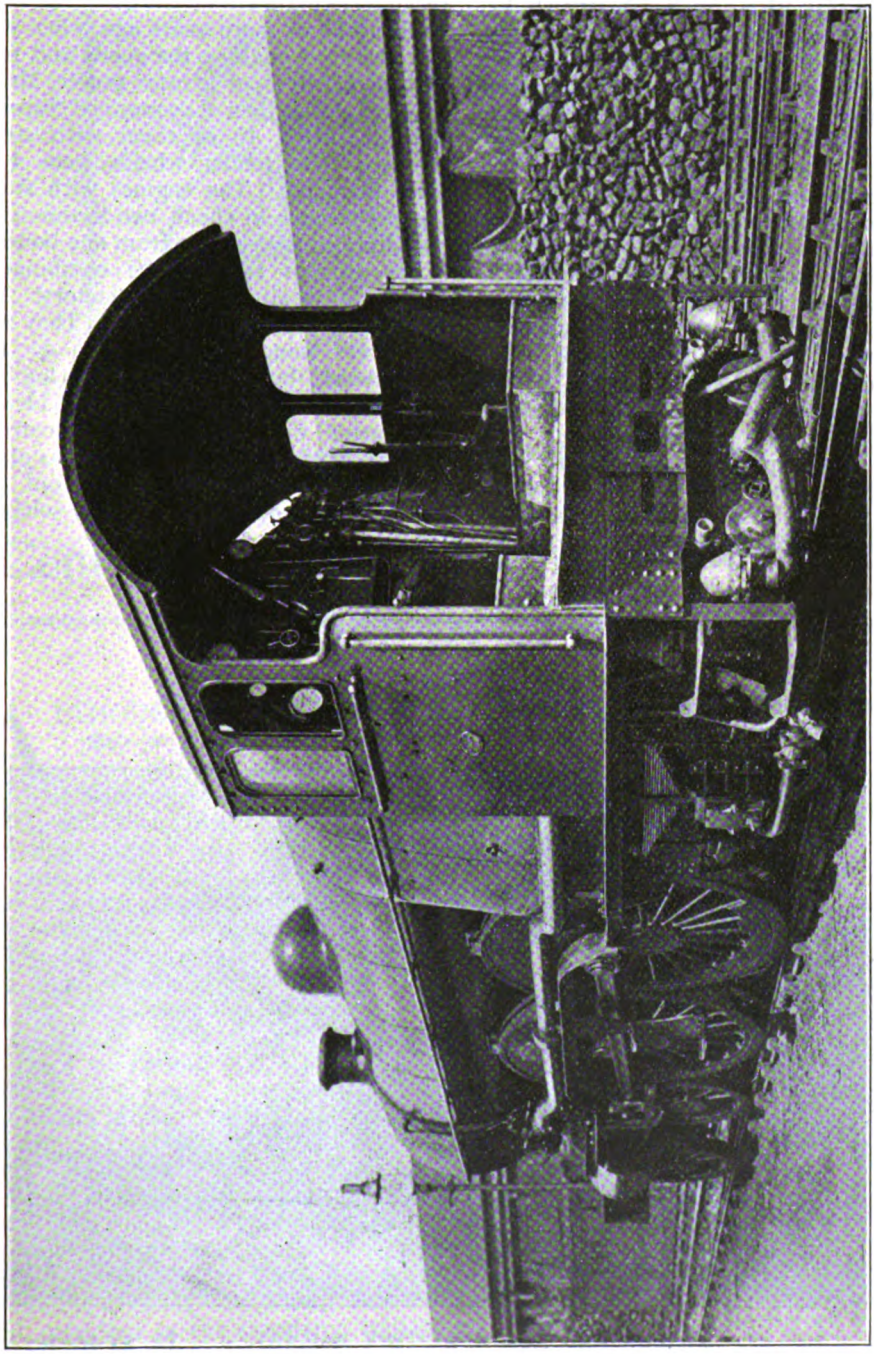

LEFT-SIDE THREE-QUARTER VIEW OF BOOSTER-FITTED "ATLANTIC" LOCOMOTIVE, LOOKING FORWARD.

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motives of the 4–4–2 type, contributed by the railways forming the group as follows: Great Northern, 116; North Eastern, 72; Great Central, 31; and North British, 22. The advantage to the locomotive power of the company in being able to convert temporarily these engines into machines which under certain circumstances are as useful as 4-6-0 locomotives, is of great moment. The use of pilot engines, often only employed because of a difficult grade on a portion of a long non-stop run, will be reduced considerably, as also will be pushers at terminal stations. With engines fitted with a booster it should be possible for the extremely heavy trains out of the termini at King's Cross, Liverpool Street, and Queen Street, Glasgow—all situate at the foot of steep inclines—to start without assistance and to get away quickly, whilst the stiff gradients *en route* will also be climbed as well by booster-fitted engines as when 4-6-0 locomotives are employed. Engines so fitted have in fact the advantages of both the 4-4-2 and 4-6-0 types.

In this connection it is of interest to recall an experiment on the Great Northern Railway 55 or more years ago, when with the object of making the goods and mineral locomotives of greater power, Mr. A. Sturrock, the then Locomotive Superintendent, fitted 46 of them with steam tenders. The tender wheels were 4 ft. 6 in. diameter. The engines with steam tenders became in effect, two locomotives, but supplied with steam from one boiler.

For various reasons the combination did not prove altogether satisfactory. The enginemen did not like them. They said they were being called upon to do two men's work, but although the firing was doubtless somewhat heavier, the idea of two men's work was far from correct. The use of these steam tenders was abandoned, the machinery was taken out and the tenders thereafter employed solely as tenders.

A "GROUPING" DEVELOPMENT.

Photo.] LONDON AND NORTH EASTERN RAILWAY. *[F. E. Mackay.*

4 p.m. Restaurant-Car train, King's Cross to Leeds.
Great Central four-cylinder 4-6-0 locomotive, No. 1163, "Earl Haig."

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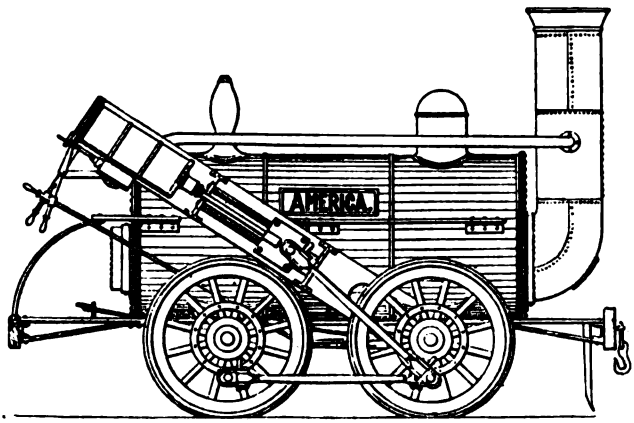

THE FIRST LOCOMOTIVE IN AMERICA, BUILT BY STEPHENSON & CO., NEWCASTLE, ENGLAND, IN 1828.

Centenary of the Delaware and Hudson Railway, U.S.A.

ALTHOUGH railways, both of the plate-way and edge-rail type, were already known, the Delaware and Hudson Canal Company as it was then titled, carried out the first experiments with steam locomotive traction in the United States. As will be seen, however, this was purely a tentative development.

The undertaking owed its origin to the discovery of anthracite (or "stone") coal in the Lackawanna Valley, and the attempts of William Wurts and his brothers to develop the anthracite coal industry. Mining was commenced by the Wurts brothers in 1822, but transport remained a problem until, on April 23, 1823, an Act was passed by the Legislature of New York incorporating "The President, Managers and Company of the Delaware and Hudson Canal Company." On July 13, 1825, contracts were let for making 17 miles of canal, Mr. Philip Hone, the first president of the company, initiating construction. On December 5, 1828, boatloads of anthracite coal were conveyed on the canal for the first time. On April 5, 1826, however, the Pennsylvania Legislature had authorised the company to construct a railroad from the head of the canal at Honesdale to coal mines at Carbondale, and on October 9, 1829, the first load of anthracite was thus conveyed from the mines to the waterside.

This railroad, 16 miles in length, was operated by horse-power on the easy sections, and by cable haulage, with the aid of stationary steam engines or water power, on the inclined planes. The possible use of locomotive engines had, however, been considered, and, while the line was under construction, Horatio Allen was sent to England with authority to purchase four locomotives. One of these, the *America*, built by Stephenson & Co., at Newcastle, was of the type then associated with the name of George Stephenson. The other three, the *Stourbridge Lion*, the *Delaware* and the *Hudson*, were built by Foster, Rastrick & Co., at Stourbridge, near Birmingham. The *America* arrived in New York in January, 1829, and, after being demonstrated under steam, was sent by water and the new canal to Honesdale, from which time all definite traces of its history appear to have

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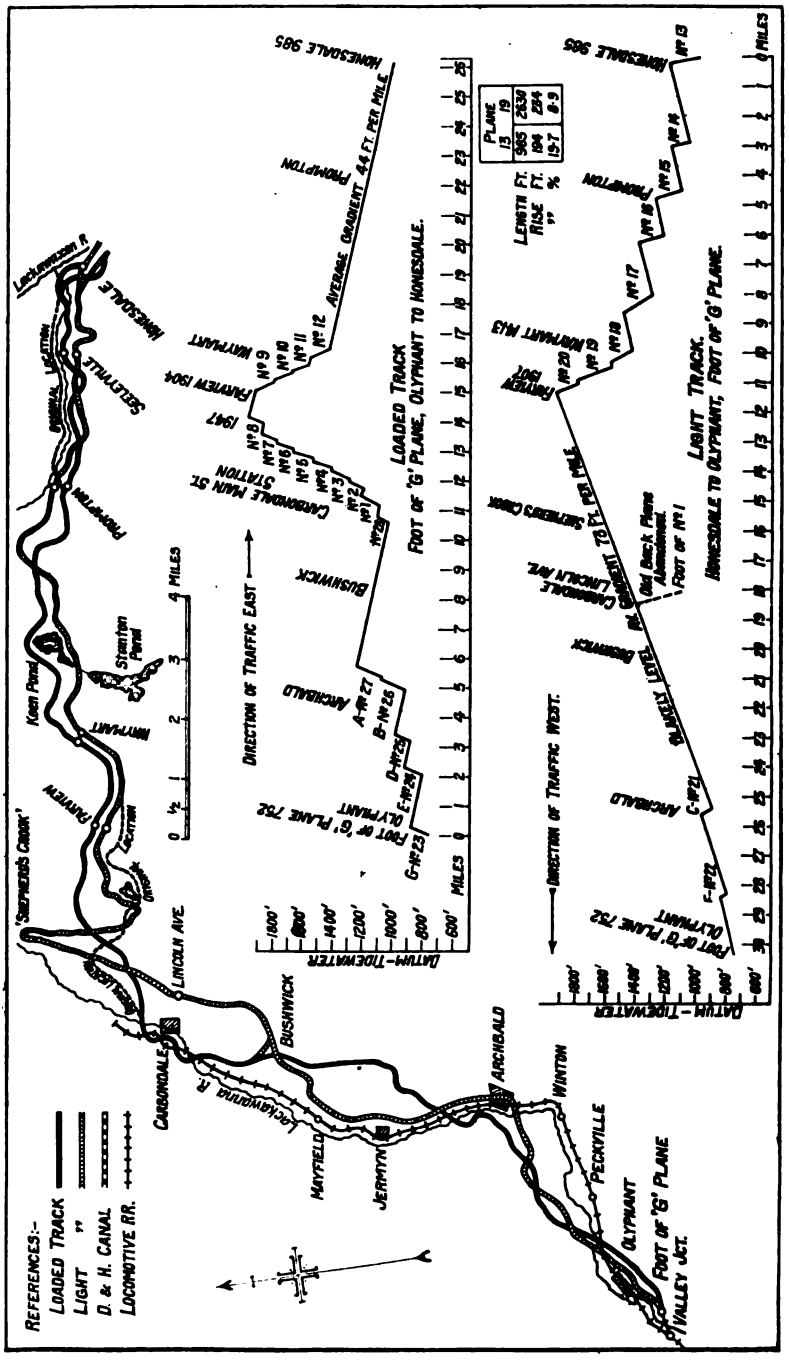

SKETCH MAP OF GRAVITY LINES BETWEEN VALLEY JUNCTION AND HONESDALE, AND GRADIENT CHARTS OF EAST AND WESTBOUND TRACKS.

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been lost, though, recently, a few parts which are regarded as having belonged to this engine have been discovered. To the *Stourbridge Lion*, therefore, as far as can be ascertained, belongs the honour of having been the first steam locomotive to run upon an American railway, having arrived in New York on May 13, 1829, and on August 8 of the same year being tested upon the railway at Honesdale. Apparently, however, the engine was too heavy for the very light strap rails carried by the soft hemlock stringers then in use, and so far as is known neither this engine nor the *Delaware* and the *Hudson* were ever used to any appreciable extent. The *Stourbridge Lion*, as reconstructed, utilising as many of its parts as could be found, is now in the National Museum at Washington.

Meanwhile, the railway continued to be operated by gravity, until steam locomotive traction was introduced upon alternative lines built under authority given by the New York Legislature on May 9, 1867, "to acquire and operate railroads in the State of New York." The gravity lines were, however, the subject of important developments, having been re-located and improved in 1832, while in 1846 the line was practically rebuilt and the inclines re-arranged, a second track being added on an independent route, with inclines as required, one being known as the "Loaded Track," and the other as the "Light Track," the former being used by loaded trains and the other for the return of "empties." Other modifications were made from time to time, but the "Gravity Road" continued in existence as such and was used for both freight and passenger business until 1899, when it was very largely rebuilt and the gauge widened to 4 ft. 8½ in., the former gauge having been 4 ft. 3 in., and regular operation by steam locomotives was commenced. The company extended its "Gravity Road" southwardly from Carbondale along the Lackawanna Valley in 1846, to a point near Archbald, Pa., where the company had purchased additional coal lands, and in 1858 it was continued to a point known as Valley Junction, near Olyphant, Pa. The road was further extended to Providence in 1861, and to Green Ridge in 1863, these last two extensions being operated by locomotives. A portion of the final extension is now the Vine Street branch in the city of Scranton. The Poplar Street branch, in the same city, was partially built in 1867 and completed some time prior to 1877.

Following upon the obtaining of powers to construct railways to be operated by steam, a new line was, in 1871, constructed from Valley Junction northward to Carbondale, practically paralleling a portion of the "Gravity Railroad." The Jefferson Railroad, between Carbondale and Jefferson Junction, built by the Erie, was operated under a running power agreement, the Delaware and Hudson Company building its own line, from Jefferson Junction to Nineveh, in 1871. At the latter point connection was made with the Albany and Susquehanna Railroad, which had been constructed between Binghampton and Albany between the years 1863 and 1869. The latter railroad was leased by the Delaware and Hudson Company on February 24, 1870, giving the company an entrance into Albany. On various dates a number of other lines were leased, taken over or constructed by the company, of which the following may be mentioned: Cherry Valley Branch (1870); Rensselaer and Saratoga Railway (1871), including leased lines built between 1832 and 1869; Delanson and Schenectady (constructed 1872); Green Ridge to near Wilkes Barre, constructed by the Union Coal Company (leased 1873), and extensions and branches subsequently constructed; New York and Canada Railroad, organised 1873, the Whitehall and Plattsburgh (constructed 1868–9) and Montreal and Plattsburgh (constructed 1852) Railways being taken over thus obtaining connection with Canada, through services being established to Montreal in 1875; Schenectady and Mechanicsville (constructed 1881), joining the Boston, Hoosac Tunnel and Western (now Boston and Maine) to reach New England; Glen Falls to Lake George (1882); Adirondack Railway (purchased 1889, but operated independently until 1902); narrow gauge lines from Plattsburgh to Dannemora continued to Lake Placid (leased 1893, converted to standard gauge, 1902), the varied interests concerned being merged into a company known as the Chateaugay and Lake Placid Railway Company (leased to the Delaware and

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HONESDALE PASSENGER TRAIN ON PLANE NO. 13.

Hudson Company, 1903); Cooperstown and Charlotte Valley Railroad (acquired 1903); Greenwich and Johnsonville (acquired 1906); Quebec, Montreal and Southern Railway (acquired 1906); extension of the latter system to Fortierville; Quebec (constructed 1909); Schoharie Valley Railway (acquired 1907); Napierville Junction Railway (acquired 1907); Hudson to Buttonwood line (Wilkes Barre), constructed jointly with the Pennsylvania Railroad (1912).

On April 28, 1899, the New York Legislature authorised the abandonment of the canal and the change of name to the Delaware and Hudson Company. The present Delaware and Hudson Railroad now possess 884 route-miles of track, utilising 490 locomotives, 457 passenger train vehicles, and 18,436 freight wagons. Commencing on November 19, 1824, the Delaware and Hudson Canal Company Bank was constituted, banking business being carried on until the expiration, in 1844, of the 20-year period set by the Legislature.

In addition to the general business of coal conveyance on the canal in early days it is interesting to note that passenger services were advertised, two boats, each with accommodation for 20 passengers, being reserved for this traffic. An advertisement of this service, which began on October 7, 1829, was published in *The New York Morning Courier and Inquirer*, showing that the fare from the eastern terminus to Honesdale was $4. There seems to have been considerable local travel also, as it was pointed out in the advertisement that the charge for way travel was 5 c. a mile. The trip was made in 36 hours. There was sleeping accommodation for the passengers.

The canal was afterwards improved and enlarged, so that boats of nearly 200 tons could be used. The culmination of the improvements came in 1849, when four suspension aqueducts were planned and constructed by John A. Roebling, who was responsible for the construction of Brooklyn Bridge. By these aqueducts the canal was carried across the Rondout, Neversink, Delaware and Lackawanna rivers. The Delaware aqueduct was carried on wire cables 8½ in. in diameter.

The original inclined planes were constructed with a single track and turnouts; but in the middle of each plane there was a stretch of 100 to 150 ft. of double track, so as to permit cars moving in opposite directions to pass. These turnouts were provided with self-acting switches, so that whenever a car passed out of the turnout in either direction the switch was left in such a position as to turn the next car moving in the opposite

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direction into the side of the turn-out thus vacated. On the west side there were five long ascending planes with a stationary steam engine at the head of each plane. By means of a chain extending the entire length of the plane these engines hauled up from three to five loaded cars (each car carrying about 1,500 lb. of coal), at the same time letting down the same number of empty cars which were attached to the other end of the chain. On the eastern side of the ridge, for the descent towards Honesdale, the three descending planes were worked by gravity, without the use of steam, the descending loaded cars drawing up the ascending empty cars. The descent was controlled by friction brakes on the shaft of a large upright fan-wheel, which thus furnished braking power by working against the resistance of the air. This original and simple scheme was, later, very much modified, the number of planes from Carbondale to the summit being increased to eight. In due course, as the company's mining operations were extended south to Carbondale, the gravity railroad was extended southward as far as Olyphant, and the eastbound or "loaded" and the westbound or "light" tracks were separated, so that in the later arrangement the loaded track had, on the east side, a single inclined plane into Honesdale something over 10 miles in length. The "light" or westbound track for empties was re-located so as to give a nearly uniform line of descent, on which the cars ran by gravity alone from the summit nearly to Archbald, south of Carbondale, in the Lackawanna Valley, a distance of about 13 miles. Until closed down the "gravity" lines were also used for passenger traffic, special "excursions" being in great favour.

LOADED COAL CARS ON NO. 23 GRAVITY PLANE.

In connection with the centenary celebrations in New York on April 23 last, a dinner was given by the directors at the Hotel Astor, in New York, when some 500 guests were present under the chairmanship of Mr. Eugenius H. Outerbridge, representing the Anniversary Dinner Committee, and Mr. Leonor F. Loree, President of the company. Before the speaker's table was a working model of the *Stourbridge Lion*. At either end of the table were models of locomotives constructed in sugar—one of them was the *America* and the other a modern "Mallet." As reported by our contemporary, the *Railway Age*, "there was a huge birthday cake lighted by 100 candles, on which an artistic pastrycook had pictured with coloured sugar in *bas-relief* the history of the company—old locomotives and canal boats down to modern trains, the whole monument, for such it was, surmounted by a miniature highway crossing showing a red light." Mr. Loree's address summarised briefly the principal developments

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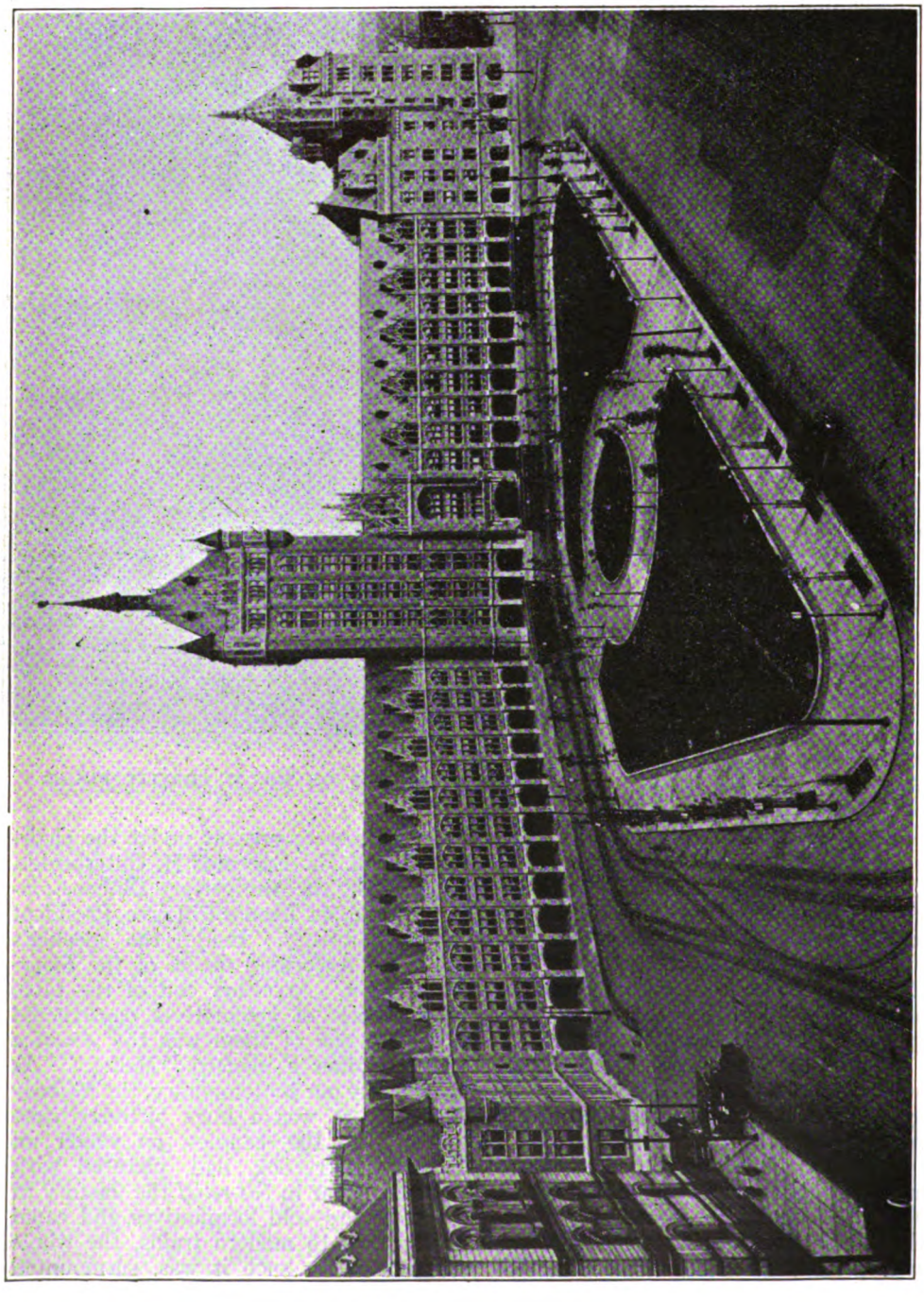

HEADQUARTERS OF THE DELAWARE AND HUDSON RAILROAD COMPANY AT ALBANY.

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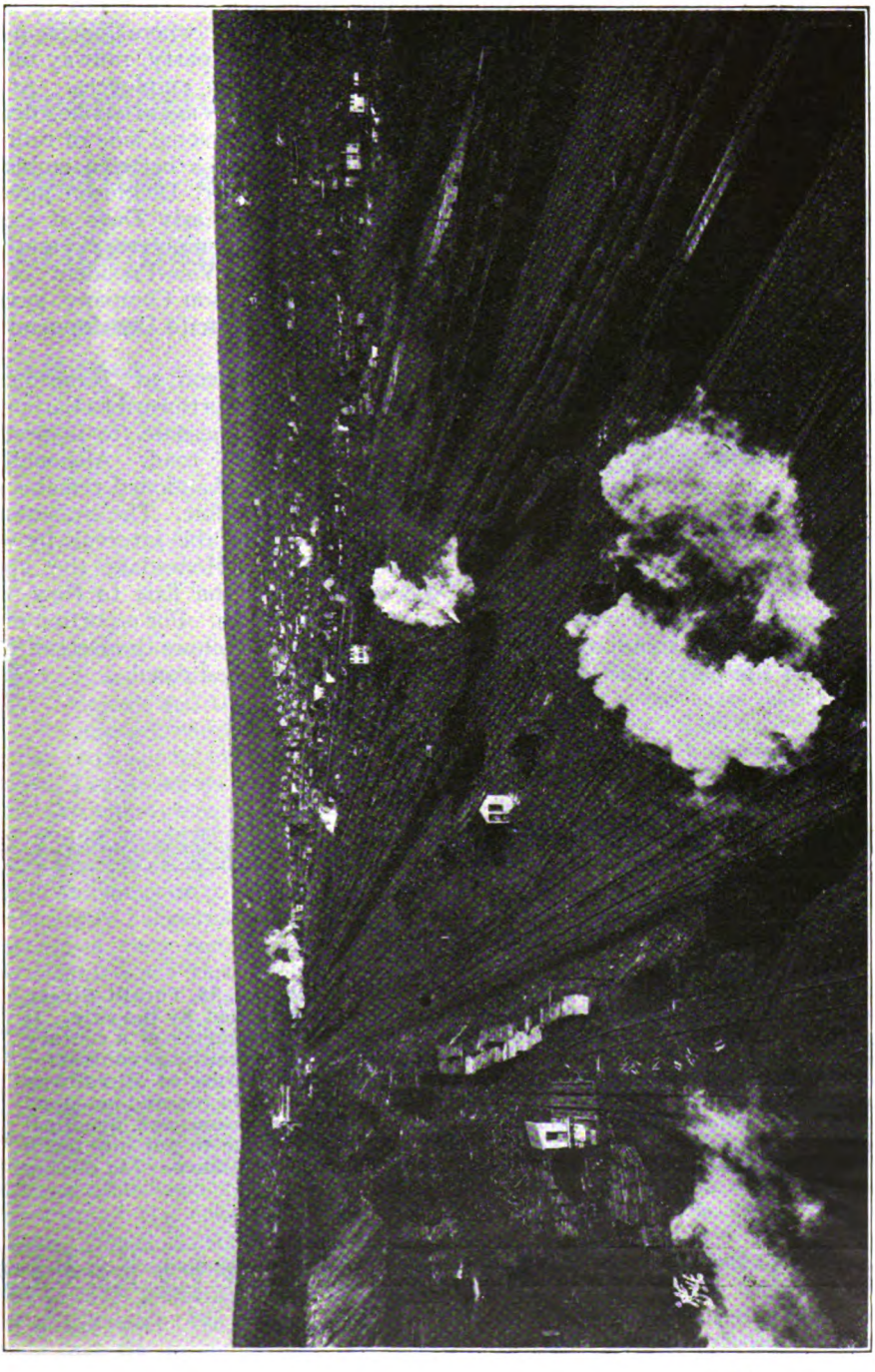

COAL MARSHALLING YARD AT CARBONDALE, DELAWARE AND HUDSON RAILROAD.

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of the company, and referred to the outstanding facts in regard to early days. Mr. James S. Alexander, President of the National Bank of Commerce, outlined the relations between banking and transportation, while Mr. H. W. Dickinson, Hon. Secretary of the Newcomen Society and Assistant to the Director of the Science Museum, South Kensington, London, gave an address, mainly historical in character, on "The Use of Steam Power." The Hon. Martin W. Littleton also spoke under the heading of "Some Fundamentals."

The following day a special train conveyed the visitors over the Delaware and Hudson Railroad, special attention being paid to the inclined sections and to the scene of the trials of the *Stourbridge Lion*. The special train left New York shortly after the dinner on the evening of April 23. It was routed over the Lehigh Valley to Wilkes Barre, where it went on to the Delaware and Hudson rails. About five miles north of Wilkes Barre, at the Hudson Coal company's Laflin breaker, a stop was made for breakfast, served in four dining cars drawn up on an adjacent track. After breakfast the party was taken on a tour of inspection of the breaker. The next move was to the Marvine breaker, two miles north of Scranton. The party was then taken in automobiles to the Hotel Casey, at Scranton, where luncheon was served to the train party, railway officers and several veteran employees. At the luncheon Mr. Loree again spoke, dealing mainly with the personal side of railroading and the relations between employers and employees. Mr. Dickinson gave an address on "The Early Days of Canals, Railways and Locomotives," and Mr. W. H. Williams, Vice-President of the Delaware and Hudson Company, gave an address on "Anthracite Development and railway Progress."

After the luncheon at Scranton the special train went northward to Carbondale and thence to Honesdale, to inspect the original "gravity" road. Although the old line has been abandoned remains of it were frequently visible. The embankment was marked at suitable intervals by white banners. From Honesdale the special was routed over the Erie to New York, reached at 8.30 p.m. For a portion of this distance the Erie follows the Delaware and Hudson's abandoned canal.

THE RAILWAY YEAR BOOK.

The "Railway Year Book" (5s. net,.5s. 6d. post free, 33, Tothill Street, Westminster, S.W.1) represents much more than is indicated by the title. It is one of those publications which has existed for over a quarter of a century and has developed into a comprehensive volume that no present-day contractor could well afford to be without, and is also of general interest to all railway undertakings, and to the "man in the street." The book is printed on good paper; it contains a vast amount of statistical information and practical details relating directly to railway matters and enables one to get into touch with the various requirements of particular lines at a glance.—*The Contract Journal.*

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst.T., A.I.Loco.E.

Photo.] [*Wm. Rogerson.*

LONDON MIDLAND AND SCOTTISH RAILWAY.

L. & N.W. section express near Carlisle.
"Prince of Wales" class 4-6-0 locomotive, No. 889.

TO return once more, and for the last time, to the subject of daily newspapers, and their views on railway matters, which formed the basis of certain criticism in my June and August articles, I came across a leading article the other day which seemed to me such a model of fair and accurately-informed comment that I venture to reproduce it in full. In June I had occasion to refer to the accuracy of the *Daily Telegraph* in handling railway matters—a very rare feature of modern journalism—and this editorial, entitled "Train Speeds," which appeared in the columns of that paper in the early days of July, fully bears out the fine reputation to which I sought to pay tribute :—

"From time to time we hear complaints that the speed of English trains is not what the public have a right to expect. It is probable that such criticism is made in ignorance of the conditions of travelling abroad. There is certainly no country on the Continent in which so much has been done towards restoring the speed and comfort of the past. We are not concerned to argue that the present conditions of railway travelling in England are as good as they could be made, but the new time-tables which have just been issued by the companies show that the long-distance trains of July, 1923, are generally as fast as, and in some cases faster than, those of July, 1914. The day expresses again reach Edinburgh and Glasgow in 8¼ hours, and there is still faster running at night. Manchester is once more brought within 3½ hours of London. A great number of expresses reach Birmingham in 2 hours. Leeds is now distant less than 3½ hours. Besides the famous non-stop run to Plymouth in a trifle over four hours, we may set another non-stop run of over 200 miles to Prestatyn, in North Wales. Torquay, which is within a few yards of 200 miles away, is now reached in 3 hours 35 min., a speed overall of more than 55½ miles an hour. Adverse critics of railway working often complain of the small number of trains which are booked to travel a mile a minute. A number of such trains will be found in the new time-tables. But this is not a fair criterion of the efforts of the railways to serve the public. It is of no great importance to anyone whether a journey of 50 or a 100 miles—and to such journeys speeds of 60 miles an hour start-to-stop must be limited—takes 5 min. more or less. What is important in express working is the reduction to a

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minimum of time spent on the journeys between London and the great industrial districts, and on the long runs to places still further afield to such an extent as to diminish the waste of time and fatigue. Twenty minutes or half-an-hour saved each way on travelling to Lancashire or the West Riding may well mean that more business can be done, and more efficiently done, for each journey taken. A high speed maintained by an express to Scotland or the West lessens the weariness of travelling, and brings the passengers to their destinations much fitter either for pleasure or work. Of no less importance than a schedule of fast running is reliability and comfort. It is better that a train should be on a comparatively slow timing and keep it to the minute than run faster and yet be late on the time-table. There is little gratification for the traveller in a high-speed train if the accommodation and the arrangements for handling luggage are inadequate. By all these matters and not only the time-tables the railways must be judged. They can in general, we believe, stand the test; they have certainly made great progress since 1919, and there can be no doubt that travelling this summer will be more agreeable than it has been for many a year."

There is no necessity to add anything to the foregoing, which is in close correspondence with my remarks of June last. It is a fair representation, I believe, of the views of that proportion of the general public which is reasonably well informed on railway matters, and it will prove a sound education to other readers of the *Daily Telegraph* who may have been misled by the railway nonsense which has received such extensive publicity recently in other journals. The foregoing will also serve as an introduction to some brief comments of my own on the summer services. I do not propose to enter into detail in regard to times, speeds and general arrangements, for that falls within the province of "Voyageur" in the forthcoming October number, but just to comment briefly on the most outstanding features of this summer's train services.

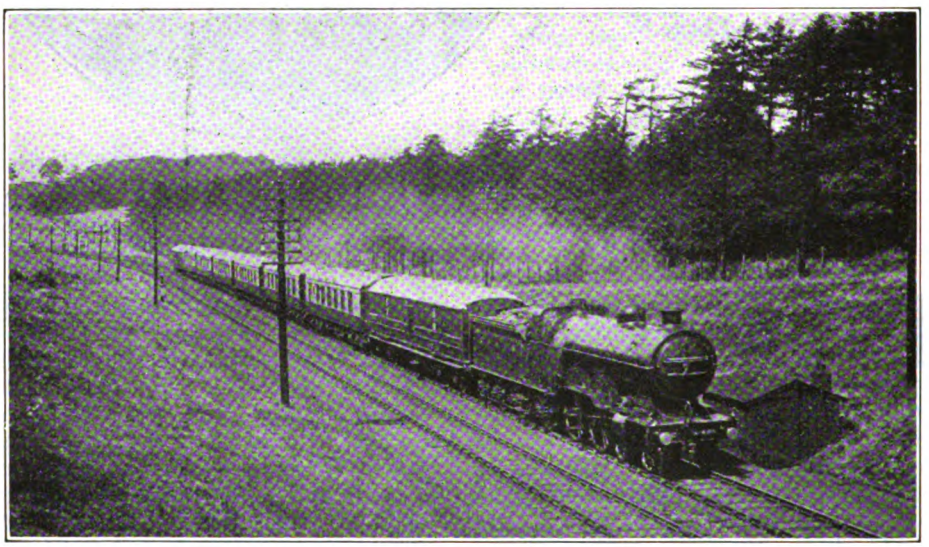

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*H. Gordon Tidey.*

Harrogate Pullman Car Express passing Ganwick. Great Northern 4-4-2 locomotive, No. 1459.

Chief honours would seem to rest with the London and North Eastern Railway. Perhaps some measure of acceleration was overdue; but the speed-up which has taken place is so thorough as to restore the various lines composing this group, not only to their pre-war position, but to an even higher level. The Great Northern section, in particular, once more takes its traditional place in the front rank of fast-

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running British lines. When talking, the other day, to a well-known British authority on train working, who contended that the London and North Eastern time-tables do not show any advance on pre-war standards, I sought to lay before him the facts which, in my judgment, give the lie to such a contention. Take the case of the King's Cross–Peterborough timings, over a distance of 76·4 miles. Before the war the five best timings from London were 82, 83, 86, 87 and 87 min., averaging 85 min.; to-day the five best are 82, 83, 83, 83 and 84 min.—an average of 83 min. Coming up the best five were 79 (a light six-coach train), 86, 86, 88 and 89 min.—average 85·6 min.—as against the present 82, 83, 83, 84 and 85 min.—average 83·4 min. And what comparison, again, is there between the loads of such trains as the 10.10 a.m. 82-min. express down, and the 1.55 p.m. 82-min. express into King's Cross. and those they carried before the war? Then they were nearly always loads of under 300 tons; to-day 350 tons and over is the more general figure.

The same question of loads applies to almost all the expresses now restored to their pre-war timings. Trains of over 50 axles are more a commonplace than the reverse on the East Coast services; the 10 a.m., 1.15 p.m., and the Highland night expresses go out frequently made up to such formations, even to 54 and 56 axles, despite the fact that the 7.35, 7.45 and 11.25 p.m. expresses are booked to Edinburgh in 8 hours, and the 8.20 p.m. in the 7¾ hours of pre-war days. The Highland trains in particular carry the additional incubus of dining-car accommodation to York or Grantham. Look at the colossal load of the 4 p.m. out of King's Cross, which, although restored to its pre-war timing, is now the pre-war 3.25 p.m. and 4 p.m. trains rolled into one. When, again, has the Great Northern time-table of the past ever contained bookings of 170 min. and 171 min. for the 156 miles from Doncaster to London, in each case with one intermediate stop, and in the former case with a frequently-made conditional stop as well?

Photo.] GREAT WESTERN RAILWAY. [*H. Gordon Tidey.*

Down South Wales Express. Two-cylinder 4-6-0 locomotive, No. 2931, "Arlington Court."

Most attention, naturally, has been focussed on the "show" trains—the non-stop London–Leeds "Pullmans" and the non-stop journeys between London and York, but these, being more moderately weighted trains, are not the same tax on locomotive power as those I have mentioned. The Leeds and Harrogate "flier," booked past Peterborough in 80 min., Grantham in 113 min. and Doncaster in 167 min., to its first stop at Holbeck in 202 min., is a train averaging in gross

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Photo.] **LONDON MIDLAND AND SCOTTISH RAILWAY.** *[F. E. Henderson.*

Down Manchester Express near King's Langley.
L. & N.W. "Prince of Wales" class, 4-6-0 locomotive fitted with indicator shelter.

weight round about 290 tons; coming up with the same load the allowances are 188 min. from Wakefield (as against the 186 min. of the old 2 p.m. up Leeds with an average load of under 200 tons), 165 min. from Doncaster, 111 min. from Grantham and 81 min. from Peterborough. As regards the York journey, a sum of the present fastest timing of 117 min. to Grantham and 91 min. thence to York, with, say, 3 min. deducted for stopping and re-starting at Grantham, leaves 205 min. for a non-stop run, as against the 210 min. allowed the 11.50 a.m. down for this journey of 188·2 miles, with an average load of nine bogie coaches, or about 300 tons. One might venture to prophesy that, before the summer is over, the Scottish portion of this express, with its convenient starting time out of London, will become very popular; from the inception of the train this was its best-patronised section. It is a pity that the up express has no corresponding connection, being practically dependent on Scarborough to London traffic for its *clientèle*; if only it could be run one hour later another year, it would connect at York with the 4.48 p.m. arrival from Newcastle and Tees-side, giving an excellent mid-afternoon service from those areas to London, with an arrival 55 min. earlier than that at present offered, and also used to no small extent by south-bound travellers.

On the North Eastern section, again, hindrances which were not experienced in pre-war days occasion harder locomotive work than previously. Loads have already been mentioned; from Ferryhill to the north side of Morpeth we now have increasing difficulties from colliery subsidences, two practically permanent cautions having been added recently at Lamesley and Longhirst—both fairly high-speed locations—additional to other points where speed must always now be moderated to some extent. As a result, we find three of the north-bound night expresses out of York booked through Darlington, 44·1 miles, in 45 min., as against the pre-war 48 min., to compensate for the loss of time occasioned ahead by these difficulties, within a booking of 90 min. from York to Newcastle. Similarly, the 144-min. bookings of five heavy night expresses over the 124·4 miles from Newcastle to Edinburgh have to allow for the Longhirst check, in addition to those at Morpeth and Berwick. We find the same load handicap over the fearful grades of the North British section north of Edinburgh, such an express as the 7.35 p.m. from Aberdeen loading nightly to a gross figure of nearer 400 than 350 tons.

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And subsidences are occurring also in the Fife coalfield, requiring additional speed reductions, such as those near Thornton Junction.

One of the most interesting features of North Eastern locomotive working this summer is that a North Eastern "Atlantic" comes down to Grantham on the 8 a.m. out of Newcastle, working back on the 5.30 p.m. out of London, neither of which now stop at York for any purpose. The latter, although arriving at Darlington 5 min. earlier than ever in its previous history, is really decelerated over the North Eastern section, with 48 instead of 45 min. allowed from York to Darlington; similarly, the timing of the Liverpool–Newcastle "diner" over this stretch is eased from 45 to 47 min., although the up Glasgow–Leeds "flier" retains its 43-min. timing from Darlington to York. The North Eastern section also takes over at Doncaster the 11.40 p.m. Edinburgh express out of King's Cross, which runs there on a non-stop timing of 174 min., and thence non-stop to Newcastle; but the 9.50 a.m. and 1.15 p.m. "Scotsmen" out of London both stop on the centre road at York to change engines. One of the chief features of the Great Northern-North Eastern alterations is the really vast improvement of the connections between London and Tees-side, so often commented on in these columns, so greatly needed and now an accomplished fact.

The Great Eastern section gets its principal summer expresses back very close to their pre-war timings; the 12.25 p.m. down runs to North Walsham in 159 min., the single extra minute being that now allowed out to Shenfield. The 12.30 p.m. Yarmouth non-stop is booked in only 3 min. over the pre-war 2½ hours, while the up Yarmouth is cut down to the exact 2½-hour limit, and this with a maximum allowed load of 44 axles of corridor stock, which is far greater than the pre-war load. The up Cromer has 162 min. in place of 159 min. from North Walsham; the two Cromer trains are limited to 48 axles, which was the usual pre-war "Norfolk Coast" formation, although in those days often exceeded at week-ends. Needless to say, the two down Continental trains, with their enormous loads (especially the 8.30 p.m.), and their 50·3 m.p.h. bookings to Parkeston Quay, are considerably the hardest thing in locomotive work that the Great Eastern time-table has to offer. On a recent evening, I have it on quite reliable authority, Driver Chapman kept time to Parkeston on the 8.30 p.m. down with a 64-axle train, which must have weighed fully 450 tons, and that despite

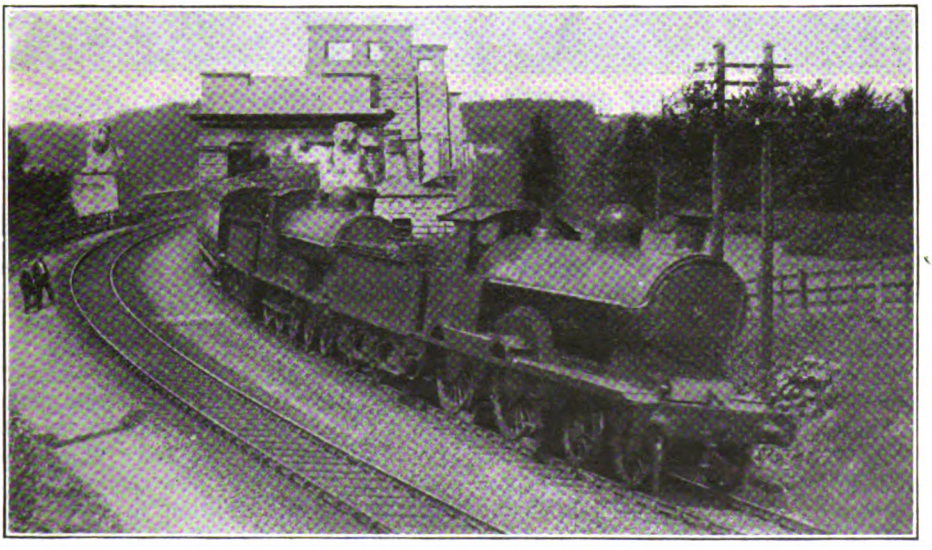

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Leslie J. Thompson.*

Up Irish Mail emerging from Britannia Tubular Bridge.
L. & N.W. locomotives: 4-4-0, No. 675, "Adjutant," and 4-6-0, No. 2073.

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a p.w.r. caution *en route*; this must have been a superb performance over such a road, and I only wish I had been present in order to put its details on record. There is no material expedition to note in the train services of the other sections of the London and North Eastern Railway except that several of the North British trains between Edinburgh and Aberdeen maintain their overall times with an additional stop at Dalmeny for attaching or detaching Glasgow portions.

The Great Western summer time-tables are enlivened by some striking schedules, and especially the much-advertised 75-min. booking from Swindon to Paddington. My first experience on the train concerned appears elsewhere in this article, and was so startling in certain of its features as to lead me to the reflection that it would be of little use for the London and North Eastern Railway or any other line to enter into serious competition with the Great Western Railway for the top place in the speed table. With so unique a length of level line, and such unique locomotives to turn it to the best advantage, the Great Western may be said to hold a hand of trumps so far as speed records are concerned. In the reverse direction 79 min. from Paddington to Swindon, with the much heavier 4.15 p.m. down, is also a first-class schedule. But I doubt if either of these, for difficulty, comes up to the Bristol 2-hour bookings, and especially the 5 p.m. up, with its Reading slack; while the bulk of the Birmingham times are, perhaps, harder still. There is no particular novelty in the West of England bookings as regards speed, which is, as always, of the highest order, although some of the non-stop journeys are of unusual interest, such as Paddington–Brent on the Saturday 11 a.m. down, the North to West runs avoiding the congested *purlieus* of Temple Meads station at Bristol by taking the Pylle Hill loop line, and so on. Birmingham–Chester is another non-stopping effort designed to make a strong bid for the Chester and Birkenhead traffic from London. The faster South Wales expresses are expedited to run in the Bristol 2-hour times between Didcot and Wootton Bassett or Stoke Gifford, and the two down expresses at 8.45 a.m. and 8 p.m. now carry Bristol slip portions as an addition to their weight, detached at Stoke Gifford East Box.

The Southern programme contains some cheerful feats of speed. In the South Western time-table are 101-min. runs in

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*Henry L. Salmon.*

Up Brighton and Ramsgate Express.
L. & N.W. 4-cylinder 4-6-0 "Claughton" class locomotive, No. 1407,
"Lance-Corpl. J. A. Christie, V.C."

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both directions over the 88 mountainous miles between Salisbury and Exeter, and a still harder 104 min. up with an intermediate stop at Sidmouth Junction; the 3 p.m. out of Waterloo also runs to Salisbury in 92 min., or only 1 min. over the pre-war best. On the Brighton section marked attention has been paid to the Eastbourne section, with the result that that popular resort may now be reached in 85 min. from London Bridge with an intermediate stop at Lewes, which is faster than anything done before the war in the down direction. Indeed, the 3.20 p.m. from Victoria to Eastbourne runs in appear in the time-tables, such as Tonbridge–Ashford, 26·5 miles, in 28 min. down and 29 min. up, Tonbridge–Folkestone, 40·5 miles, in 43 min. and 47 min., Red Hill–Tonbridge, 19·5 miles in 22 min., and so on.

On the London Midland and Scottish Railway the chief alterations on the Western division, which restored the 3½-hour Manchester and 3 hours 35 min. Liverpool timings, were made a few months previously, and beyond the acceleration of the chief Scottish trains back to their pre-war schedules, or near them, there are few more changes of any

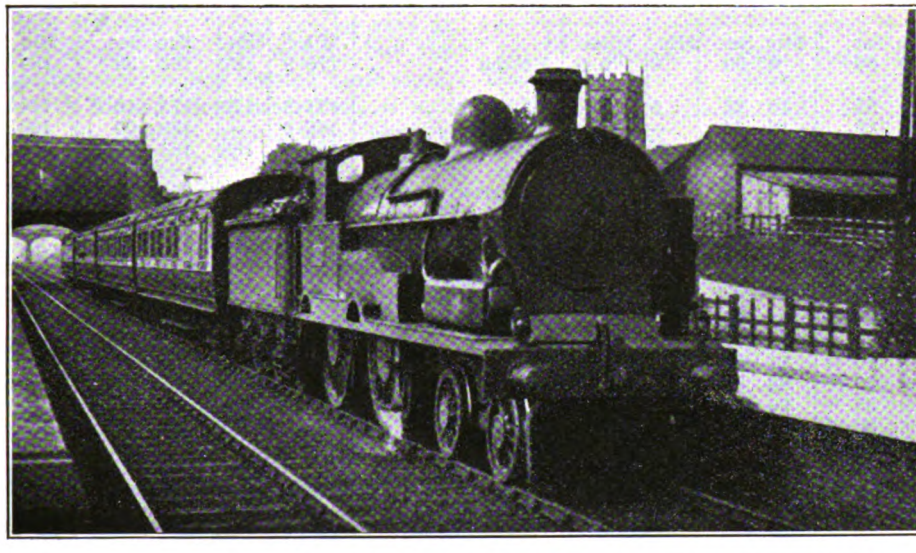

Photo.] **LONDON MIDLAND AND SCOTTISH RAILWAY.** [*Henry L. Salmon.*

Up Express passing Shilton.
L. & N.W.R. 4-4-0 "George the Fifth" class locomotive, No. 1472, fitted with Weir Feed-water Pump and Heater.

the "Belle" timing to Keymer Junction, with 1 min. extra for the slack over the junction, and the 5.5 p.m. from London Bridge similarly follows up the 5 p.m. 60-min. Brighton train to Keymer. Strangely enough, however, the 90-min. non-stop booking in the up direction remains without expedition. On the South Eastern section the 1 p.m. (late 1.30 p.m.) ex-Charing Cross becomes an 80-min. train to Folkestone, and a new down train on Fridays at 5 p.m. takes the same time from Cannon Street; the 9.15 a.m. up reaches London Bridge in 79 min.; and various short and quite brilliant start-to-stop runs note. Day Scotch trains, by the way, benefit by the omission of Willesden stops in both directions, and are thus easier to work than before the war. Of the summer changes, the run of the 5.20 p.m. ex-Liverpool from Crewe to Euston in 171 min. non-stop is the best, although this is still not the fastest train between these points, that honour being claimed by the down night "Newspaper," at 11 p.m. from Euston, which covers the 158 miles in 169 min. The Rhyl non-stop reappears, save that its flight is cut short by 3½ miles to allow of a stop at Prestatyn; in the up direction the corresponding train calls at

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Bletchley. The Midland time-table remains practically *in statu quo ante*, despite the competition to and from Leeds, Bradford and the West Riding offered by the London and North Eastern speed-up; and there are no developments in other London Midland and Scottish directions making increased demands upon the schedule on that line, from Kettering to St. Pancras, 72 miles in 76 min., at 56·8 m.p.h. Altogether, then, the accelerations of 1923 have falsified the expectation, expressed in some quarters, that grouping might put an end to competition and incentive in passenger travel facilities in this country.

L.M. & S.R. (WESTERN DIVISION): EUSTON–WILMSLOW.

1092 "Claughton" 44 292 305	2073 "Prince" 48 316 340	Schedule.	Distance.	Engine: 4-6-0 No. Engine, class: Load (axles): Load (tons tare): Load (tons full):	Distance.	Schedule.	1092 "Claughton" 34 224 240	2293 "Prince" 28 203 215
Min. Sec.	Min. Sec.	Min.	Miles.		Miles.	Min.	Min. Sec.	Min. Sec.
0 00	0 00	0	0·0	Euston	176·9	187	182 30	184 00
								p.w.r.
9 55	10 25	9	5·4	Willesden	171·5	179	175 10	174 05
16 45	16 30	—	11·4	Harrow	165·5	—	170 00	168 35
23 35	22 50	23	17·5	Watford	159·4	168	163 55	163 20
							sigs. sev.	
31 30	30 45	—	24·5	Boxmoor	152·4	—	155 55	157 40
40 00	39 10	39	31·7	Tring	145·2	154	149 30	151 20
47 35	46 45	—	40·2	Leighton	136·7	—	139 55	143 00
53 20	52 15	53	46·7	Bletchley	130·2	138	133 20	137 10
58 35	57 20	—	52·4	Wolverton ..	124·5	—	127 55	132 05
66 40	65 35	66	59·9	Roade	117·0	125	121 25	125 45
69 40	68 45	—	62·8	Blisworth	114·1	—	118 40	122 55
76 20	75 10	—	69·7	Weedon	107·2	—	112 30	116 40
82 10	81 00	—	75·3	Welton	101·6	—	107 05	112 00
89 40	88 35	89	82·6	Rugby	94·3	102	97 35	103 15
99 55	99 15	—	91·3	Shilton	85·6	—	89 20	95 15
105 30	104 50	105	97·1	Nuneaton ..	79·8	87	83 05	88 55
114 20	113 35	—	106·5	Polenorth ..	70·4	—	73 30	79 15
p.w.r.								p.w.r.
117 50	116 55	119	110·0	Tamworth ..	66·9	73	70 10	75 15
124 15	123 20	—	116·3	Lichfield	60·6	—	64 45	69 05
								sig. stop.
132 45	131 50	133	124·2	Rugeley	52·7	59	57 25	56 10
137 55	137 10	—	129·5	Milford	47·4	—	52 25	50 55
142 35	141 50	143	133·6	Stafford	43·3	49	47 35	45 25
148 40	148 15	150	138·9	Norton Bridge ..	38·0	42	42 55	40 55
sigs. sev.								
161 10	157 25	—	147·6	Whitmore ..	29·3	—	35 00	33 25
167 25	162 45	—	153·3	Betley Road ..	23·6	—	27 55	26 45
173 00	167 45	170	158·1	Crewe	18·8	21	21 20	19 55
179 20	174 25	176	162·6	Sandbach	14·3	15	16 40	14 50
185 30	180 40	—	168·4	Goostrey	8·5	—	11 20	9 50
	p.w.r.							
192 45	188 50	—	175·2	Alderley Edge ..	1·7	—	3 40	3 30
195 05	191 20	191	176·9	Wilmslow ..	0·0	0	0 00	0 00
190½	190	191	176·9	Net times (min.)	176·9	187	180	174½

locomotives, with which I am chiefly concerned in the present article. There is one notable exception in the Midland case, the insertion of a stop at Kettering, in the schedule of the 10.40 a.m. from Edinburgh to London, having secured the reinstatement of the fastest pre-war

In the accompanying table are shown in detail my first experiences on the reinstated 3½-hour Manchester expresses of the London Midland and Scottish Western Division. The down train, now composed chiefly of Midland stock, on account of its lighter weight in proportion to passenger

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seating capacity than the standard London and North Western stock, is a harder proposition than in pre-war years. In fact, the "Prince" 4-6-0—No. 2073—had a distinctly tough task with a 48-axle train of 340 tons. The "Claughton's" work on the down journey was not more than moderate, however. We were doing 53 m.p.h. at Pinner, and 50½ was the minimum before Tring; beyond Cheddington we got up to 75, and this was the precise moment seized upon by a fellow-occupant of the dining car to remark to a friend: "What a tremendous time these trains take to accelerate nowadays—it is always Bletchley or Roade [*sic*] before they get up to their full rate!" Our precise rate at Roade summit was 50½ m.p.h., but the would-be speed expert seemed quite satisfied with his confident assertion; it is a tribute to London and North Western track and rolling-stock, anyway, that 50 and 75 m.p.h. are indistinguishable speeds! At Kilsby the minimum rate was 53 m.p.h., and before Rugby we touched 66; after that 69 m.p.h. at Nuneaton and 70½ at Betley Road were the highest speeds. Only a slight check was made over the Polesworth colliery caution, but the signal check between Standon Bridge and Whitmore was lengthy and to a walking pace, and we slowed to 20 m.p.h. through Crewe. Net time was just inside schedule.

No. 2073 made a fine start, reaching 61 m.p.h. before Sudbury, only falling to 56½ at Pinner, and touching 62½ at Watford; thenceforward the going was easier, but we maintained 53½–51 m.p.h. all the way up the 1 in 330 to Tring. Beyond Cheddington we touched 72½ m.p.h., and the same rate was sustained for some distance between Bletchley and Wolverton, with the result that we covered just over 55 miles in the first hour. Minimum at Roade was 51 m.p.h. After Nuneaton we attained 71½ m.p.h., and at Polesworth, where there was no slack, 64½; after that the best work lay in a maintained speed of 57½ m.p.h. up the gradual rise from Standon Bridge to Whitmore, and a top speed of 75 m.p.h. before Crewe, which we passed at 20 m.p.h. in 167¾ min. from Euston. The concluding check was unfortunate, but we maintained time, and by running the remaining 11·6 miles from Wilmslow to Manchester in 15½ min., start-to-stop, with a maximum of 68 m.p.h. at Gatley, we completed the journey in exactly 1 min. under the 3½ hours.

The 10.40 a.m. down is a less interesting train, as on account of its weight it is always piloted. On my last journey with it, behind a non-superheated "Precursor" 4-4-0 and "Prince" 4-6-0 No. 1679, *Lord Byron*, hauling a 56-axle train weighing in all 445 to 450 tons, we had a p.w.r. check costing 2 min. at Kilburn, but passed Willesden in 11 min. 20 sec., Watford in

L.M. & S.R. (WESTERN DIVISION)
RUGBY–CREWE.

Engine 4-6-0 "Prince," No. 268.
Load: 60 axles, 421 tons empty; 450 tons full.

Distance.	Stations.	Schedule.	Times.	†Speeds
Miles.		Min.	m. s.	m.p.h.
0·0	Rugby	0	0 00	—
5·5	Brinklow.. ..	—	9 00	—
8·8	Shilton	—	13 00	—
10·9	Bulkington ..	—	15 25	—
14·6	Nuneaton ..	17	18 55	67
19·8	Atherstone ..	—	23 55	61
23·9	Polesworth ..	—	27 40	67
27·4	Tamworth ..	31	30 55	—
33·7	Lichfield	—	37 10	—
38·4	Armitage.. ..	—	42 20	52
41·6	Rugeley	46	45 30	64½
44·5	Colwich	—	48 20	—
46·9	Milford	—	50 40	60
51·0	Stafford	57	55 05	40*
54·3	Great Bridgeford	—	59 10	—
56·3	Norton Bridge ..	64	61 30	—
60·9	Standon Bridge ..	—	67 00	—
65·0	Whitmore ..	—	71 40	50
67·5	Madeley	—	74 35	—
70·7	Betley Road ..	—	77 35	69
75·5	Crewe	87	83 20	—

† Maximum and minimum speeds, by chronograph.
* Service slack, Trent Valley Junction.

25¼ min., Tring in 41¼ min., Bletchley in 55¼ min. (maximum 70½ m.p.h. at Leighton), Roade in 68¼ min., at 50 m.p.h., and Welton in 82¾ min., after which came a maximum of 70½ m.p.h. at Hillmorton and then a virtual stop for signals at Clifton Road, costing 2¼ min. So it took us 92½ min. to get through Rugby, or 88¼ min. net. Nuneaton was passed in 108 min. 40 sec., after another slight signal check, Polesworth in 117½ min., at 69 m.p.h. (after which we slacked slightly over the colliery area), Tamworth in 120¾ min., Rugeley in 135 min., Stafford in 144 min.

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20 sec., Whitmore in 159 min. 25 sec., at 57 m.p.h., and Betley Road in 164¾ min., at 75 m.p.h. After a very slow run in, Crewe was reached in 171¾ min. from Euston, 3¼ min. early, or about 166½ min. net—an excellent, although, on account of the double-heading, by no means a record performance. It is characteristic of many I have had on this train, on certain of which considerable amounts of time lost by delays *en route* have been regained. As regards heavy unpiloted down trains, the Western Division regulations are now so strict that one seldom gets a load worth timing, as compared with pre-war loads. and with the same load, had a bad p.w.r. caution at Chalk Farm costing 2 min., but passed Willesden in 11 min. 50 sec., Watford in 26 min. 10 sec., Tring in 42 min. 50 sec., at 48 m.p.h., Bletchley in 56 min. 20 sec.—having sustained 70½–71½ m.p.h. most of the way down from Tring—and then got signals on at Wolverton, costing us 1¾–2 min. Roade was passed in 71 min. 10 sec., at 48½ m.p.h., and Welton in 87¼ min., at 50 m.p.h., with a faint prospect still of keeping time, which was effectually dispelled, however, by signals on at Hillmorton and Clifton Road, the latter bringing us practically to a dead stand, and

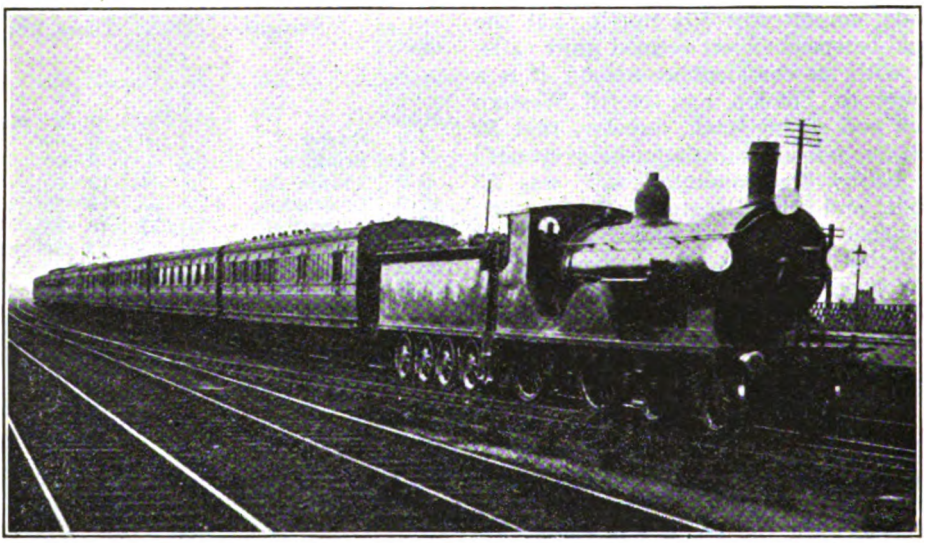

Photo.] SOUTHERN RAILWAY. [*Henry L. Salmon.*

Up Bournemouth Restaurant Car Express. L. & S.W. rebuilt 4-4-0 locomotive, No. 313.

For both 4-6-0 classes of engine 360 tare tons is the maximum winter figure south of Carnforth, although in the summer this is increased to 400 tons.

On the 10 a.m. down No. 442, a Beardmore "Prince," with 52 axles, 369 tons tare and 390 tons full, passed Willesden in 11 min., Watford in 25 min. 10 sec., Tring in 41 min. 50 sec., Bletchley in 56 min., Roade in 70 min. 10 sec., and Welton in 86 min. 20 sec., reaching Rugby in 95 min. 10 sec., practically as then booked. Minima at Tring, Roade and Kilsby summits were in each case 48½ m.p.h., and the maximum at Cheddington 69 m.p.h. No. 1103, "Claughton," on the same train making our time to Rugby 98 min. But the net time was very little, if at all, over 92 min. This train has now been accelerated to a 90-min. run to Rugby, which requires some smart locomotive work.

The best of these journeys, which are some out of many similar ones in my logbooks, was one on the 8.30 a.m. down "Irishman" behind "Claughton" No. 1741, with a much heavier train of 56 axles, weighing 395 tons empty and 420 tons full. From the stop at Willesden we passed Watford in 17 min., and Tring in 33 min. 50 sec., at 47½ m.p.h., after which followed some fast running, mostly sustained at 70½–71½ m.p.h. from Cheddington

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to Bletchley, whereby the 23·1 miles from Tring to Castlethorpe were covered in 20¾ min. Bletchley was passed in 47¼ min., Roade in one hour exactly, at 52 m.p.h., Weedon in 69¾ min., at 64½ m.p.h., and Welton in 75 min. 40 sec,. after which we touched 66 at Hillmorton and stopped at Rugby in precisely 84 min., the booking then in force. The allowance is now 83 min.

North of Rugby I had a run with a Beardmore-built "Prince," which was of such extraordinary merit, in consideration of the weight of the train, that I have set it out in a separate table. Presumably no pilot was available, as, although we had come down from town double-headed, No. 268 was faced with the taking forward of this 60-axle train unaided; the weight of train and tender, indeed, must have been 7½ times the weight of the engine. Yet in these arduous circumstances the run of 75·5 miles was made in 83 min. 20 sec., or 3¾ min. inside the schedule then in force—a magnificent piece of work indeed. In fact, this is one of the best runs I have ever yet timed with a "Prince," and is another testimony to the all-round handiness of these comparatively small engines.

I come now to the up Manchester runs. Of these only one is a recent performance, the other being that fine pre-war effort by Driver Lamb, of Longsight, with "Prince" No. 2193, which I described in detail in the January issue of 1915. The "Claughton" run was excellent, but is characteristic of what is being done daily on this train now. The stock on this service is entirely of the Lancashire and Yorkshire type, again for purposes of weight reduction, but even so the load of to-day is 15 per cent. above that of pre-war days. No. 1092's trip was made on a bad day, with violent westerly wind and rain, but this seemed to have little effect on the work done. We reached 70½ m.p.h. on the slightly falling grades past Sandbach, and reduced to 30 through Crewe station. Accelerating rapidly to 48½ m.p.h. thereafter, we did not go below 47½ on the 1 in 177 of Madeley bank, and accelerated to 50 on the 1 in 330. On the gradual fall towards Stafford we got up to 74 m.p.h., but then shut off steam and dropped to 65 at Great Bridgeford. Beyond Rugeley we were doing 69 m.p.h., and at Hademore troughs (between Lichfield and Tamworth) attained a full 75 an hour, after which we went a little more easily until approaching Rugby, where we were doing 68. Rugby slack was made with scrupulous care (as had been that at Stafford), speed being reduced to 35 m.p.h.

After this we continued without apparent exertion, not exceeding 65 m.p.h. at Weedon, and passing Roade at a minimum of 60; touching 72½ m.p.h. at Castlethorpe, we breasted Tring at 53½, and reached 72½ again at King's Langley, before the very severe check at Watford. Sudbury was passed at 69 m.p.h., Willesden at 66, Kilburn at 64 (here we shut off steam), and Primrose Hill Tunnel was entered at 60, prior to a slack to 30 at Chalk Farm. These speeds made for a fast finish from Willesden; in fact, the time from the centre of Willesden Junction to the platform end at Euston was only 6 min. 40 sec., but we spent another 40 sec. in crawling up the platform to the stop. Even so, we were well before time, and the pace had been practically a mile-a-minute average all through, as witness the following times:

G.W.R. SWINDON–PADDINGTON.

Engine 4-6-0 No. 2915, *Saint Bartholomew*.
Load: 32 axles, 218 tons empty; 235 tons full.

Distance.	Stations.	Schedule.	Times.		§Speeds.
Miles.		Min.	M.	S.	m. s.
0·0	Swindon	0	0	00	—
5·7	Shrivenham ..	—	7	20	74
10·7	Uffington ..	—	11	25	77½
13·4	Challow	—	13	35	75
16·9	Wantage Road ..	—	16	20	77½–*40
20·8	Steventon ..	—	21	20	60
24·2	Didcot	24	24	20	70½
28·8	Cholsey	—	28	25	67
32·6	Goring	—	31	40	70½
35·8	Pangbourne ..	—	34	25	72½
38·7	Tilehurst ..	—	36	50	76½
41·3	Reading	40	39	00	72½
46·3	Twyford	45	43	10	76½
53·1	Maidenhead ..	50½	48	40	76½
54·8	Taplow	—	50	00	76½
56·3	Burnham Beeches	—	51	15	79
58·8	Slough	55½	53	15	40†
64·1	West Drayton ..	—	59	20	64½
68·2	Southall	64	63	15	eased
71·6	Ealing	—	66	25	—
76·0	Westbourne Park	—	70	55	—
77·3	Paddington ..	75	73	35	—

* P.w.r. check for 1 mile.
† P.w.r. check, Dolphin Junction.
§ Maximum and minimum speeds, by chronograph.

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from Crewe, 158·1 miles, 161 min. 10 sec.; from Stafford, 133·6 miles, 134 min. 55 sec.; from Nuneaton, 97·1 miles, 99 min. 25 sec.; from Rugby, 82·6 miles, 84 min. 55 sec.; from Bletchley, 46·7 miles, 49 min. 10 sec. Deduct 7 min. 20 sec. for the 5·4 miles from Willesden into Euston, and the times and distances will all be found to represent just over or under "even time." The exceptional running of No. 2293 was described so fully in January, 1915, that I need not recapitulate the details. Neither will I deal with various other up runs on heavier trains, as, although, quite good from the time-keeping point of view, they lack distinction by comparison with pre-war practice.

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*G. C. Hartley.*

Train for Derby leaving Stoke-on-Trent.
North Staffordshire locomotives: 4–4–2 tank, No. 13 and (pilot) 2–4–2 tank, No. 52.

And now for that final *bonne bouche!* As it was my intention to catch the 5.30 p.m. from King's Cross to Darlington, it is evident that the time-keeping of the new Great Western record-breaker was a matter of live importance to me, seeing that it was not so much as due at Paddington until 5 p.m. But the moment we were away from Swindon all my doubts were set at rest—that is, short of a breakdown or some other fearsome casualty. The acceleration out of Swindon was perfectly amazing. At the end of 2¾ level miles we were doing 61½ m.p.h.; at 3¼, 65 m.p.h.; at 3¾, 69 m.p.h.; at 4¼, 72½ m.p.h.; and at 4¾, 74 m.p.h.—that is to say, we were up to 74 an hour in less than five miles from the dead start, and on the level! Speed fluctuated between 72½ and 77½ m.p.h. down to Wantage Road check, from which we accelerated to 70½ m.p.h. at Didcot. Then there came a distinct easing to Cholsey, after which up we went again to 76½ at Pangbourne, and also at Maidenhead, with a slight drop to 72½ in Sonning Cutting, and a further acceleration to 79 at Burnham Beeches. We should probably have reached 80 at Slough, were it not for the permanent way check at Dolphin Junction, for which the driver shut off before reaching Slough station. After that we positively ambled into Paddington, getting a perfectly clear road, and arrived 1 min. 25 sec. before time, despite the afore-mentioned amble, and two delays costing at least 4 min. between them! Under 70 min. net for a journey of 77·3 miles, and a slow finish to avoid too early an arrival! If the Great Western Railway is setting out seriously to capture and retain the blue riband of start-to-stop railway speed, as I remarked previously, in such circumstances as these it would seem idle for any other aspirant so much as to attempt to compete!

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Royal Agricultural Show Traffic at Newcastle.

AS mentioned last month, the Royal Agricultural Show at Newcastle-on-Tyne in the early part of July entailed special obligations upon the London & North Eastern Railway. Preliminary planning of the special arrangements and schemes was, as usual, settled months beforehand by the several departments with the headquarters staff of the North Eastern area at York, and the officials mainly responsible for superintending the operations were Mr. W. A. Fiddian, District Superintendent, Sunderland, Mr. G. Hope, Divisional Superintendent, Newcastle, Mr. E. F. Wilkinson, District Passenger Manager, Newcastle, and Mr. C. A. Lambert, Divisional Goods Manager, Newcastle, whose efforts were well seconded by their staffs.

Photo.] [*Newcastle Chronicle.*

STAFF QUARTERS, INCLUDING DINING CARS, AT FORTH LOADING DOCK.

At Newcastle the special problems arose from the fact that the Showyard was remote from the railway and that all the exhibits had either to be walked or carted to the site. This imposed heavy demands on the cartage section, and the difficulties were augmented by the fact that the Show traffic had to be conducted through the busiest streets of the busiest city in north-eastern England. Railway traffic also had to be adjusted to work with the normal services of the Tyneside industrial area. The Royal Show followed Newcastle race week, the popular holiday on the Tyneside, when several of the larger works close for one or more days, involving a pressure at the end of the week from the arrears of the "off" days. The Prince of Wales' visit to Newcastle, apart from the visit to the Show, synchronised with the Show week, and accentuated the passenger traffic. Fortunately the London and North Eastern Railway is well provided with sidings and goods depôts, and these, with a little adaptation, were equal to the extra strain entailed by the Show. The cattle docks at Forth Banks, where the live-stock was handled, are right in the centre of a very busy section of the city. They face the Forth Banks goods warehouse on the opposite side of Shot Factory Lane, and are served by lines from the south over the King Edward Bridge, and also by way of Scotswood Bridge and the Carlisle line and behind Central station from the north, and from the south and County Durham by the High Level bridge. Implements were dealt with at New Bridge Street, somewhat nearer the Town Moor, which was the site of the Show.

Some readjustments were needed for the accommodation of the live-stock specials, which were mainly stored at Low Fell on the Team Valley main line, and at Heaton on the north line. Some provision was also made for storage at Blaydon colliery sidings on the line to Hexham. The principal "works" connected with the Show arrangements were the provision of various temporary offices at the three cattle docks and in the Showyard, with special telephonic communication, includ-

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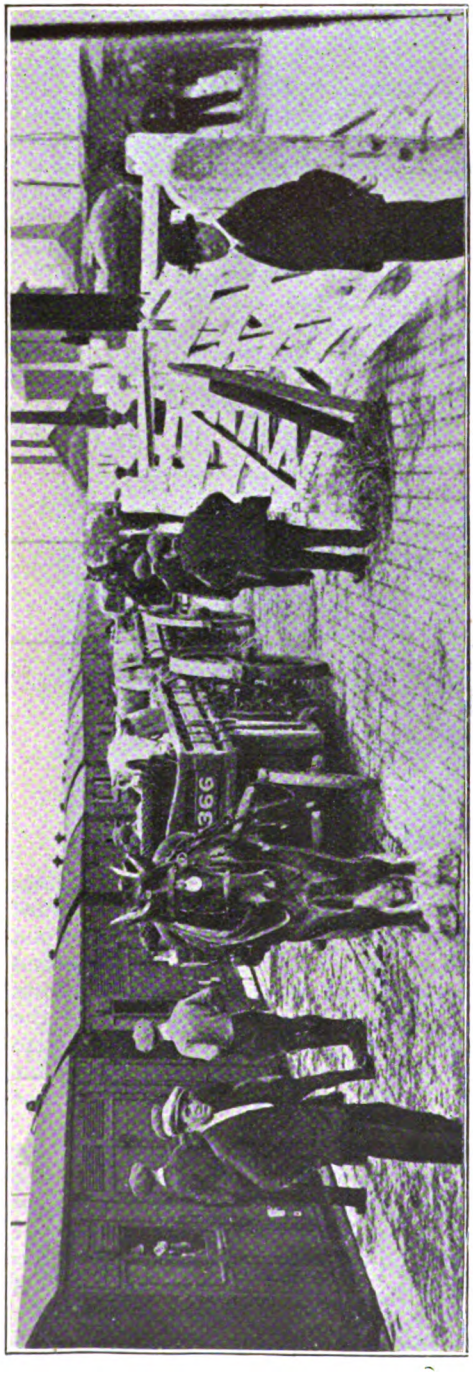

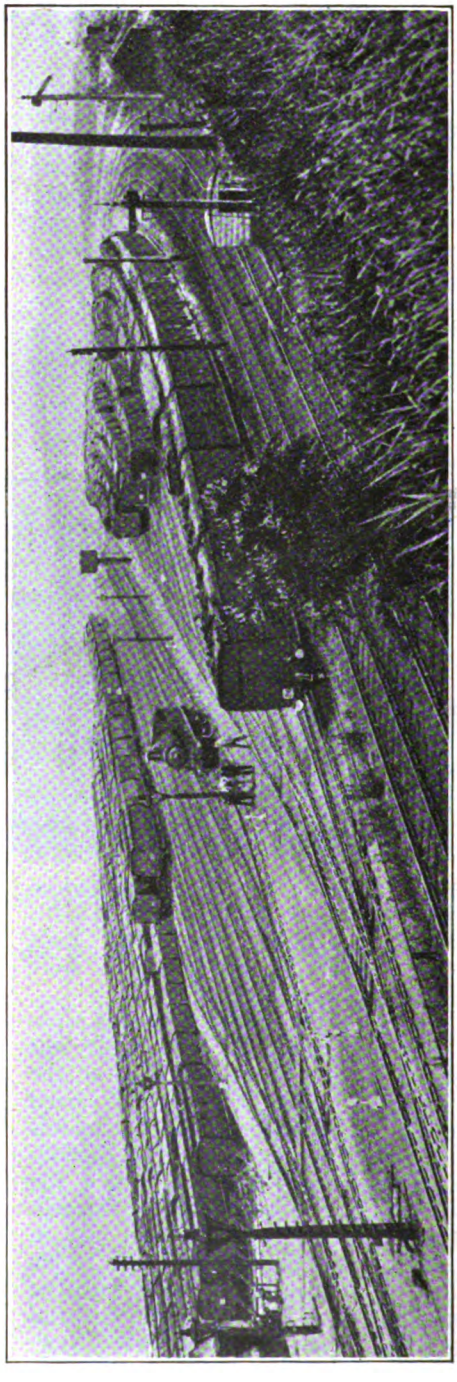

ROYAL SHOW TRAFFIC AT NEWCASTLE-ON-TYNE.

Top view: Loading Stock Special at Forth Loading Dock.
Bottom view: Storage of Special Stock trains at Low Fell Sidings.

Photos.] [*Newcastle Chronicle.*

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ing an installation to the Newcastle Central "Control" from the Showyard. For the convenience of visitors attending the Show and requiring information regarding passenger train services the London and North Eastern Railway provided a new inquiry pavilion, of a very handsome character. There was also a parcels receiving office on the Show ground, and both were much appreciated and patronised by the public.

One of the special difficulties of working the Show traffic was caused by the fact that the Showyard was not immediately adjacent to any of the railway sidings or depôts. Consequently arrangements had to be made for carting all classes of traffic from the railway company's premises to the ground. Implements and machinery traffic was concentrated at the New Bridge Street station, so as not to interfere with the general town traffic, which it was known beforehand would be very heavy after the race week and Show periods. Consequently a special staff of men were drafted to New Bridge Street, and the company provided a 5-ton steam crane, a 15-ton steam crane, and a variety of road vehicles to suit every need. An office was erected at the Showyard gateway near the special machinery entrance, and this was placed in telephonic communication with the two goods stations and the chief office in Newcastle and the general inquiry office for all goods traffic at the Show.

In addition to the live-stock traffic conveyed by ordinary train, and the implements which were dealt with as described, 47 special live-stock trains, consisting of over 950 vehicles, were dealt with inward. These all arrived at Forth Goods Yard, the first to arrive reaching the cattle dock at 11.43 on Friday, June 29, the last being dealt with at 2.40 on Monday afternoon, July 2. Of these, 16 arrived at or before time, 15 were not more than a quarter of an hour late, 4 not more than half an hour late, 9 not more than 60 minutes late, while 3 were just over the hour. They carried a total of 3,195 animals made up of 491 horses, 989 cattle, 912 sheep, 877 pigs, and 17 goats, distributed over 1,086 vehicles.

For the outward traffic the marshalling sheets showed 3,157 animals despatched, being 515 horses, 812 cattle, 930 sheep, 857 pigs and 43 goats. These required 45 outward specials, including one special in connection with the auction sales. In addition to the exhibits conveyed by special trains to Newcastle, there were about 150 vehicles by ordinary passenger trains and others by goods trains, making a total of about 1,100.

A special map of the centre of Newcastle was issued to exhibitors showing five routes from the company's docks to the Showyard. This marked the three arrival loading docks at Victoria Sidings and Forth and the loading dock at New Bridge Street, in colours. Route A, which was designed to miss the busier parts of the town, was adopted for all live-stock walking from Forth Docks to the Show and back again, mainly horses and a few cattle. Route B, which avoided some of the busier parts but not all, went through four of the principal streets, and was a cartage route, while Route C offered an alternative for a portion of the way. Route D dealt with all traffic arriving and departing at Trafalgar Dock which either walked or required cartage, this avoiding the busier streets in the vicinity, and by a somewhat circuitous route joining the main road at Barras Bridge, while a fifth route, that taken by the implements, led from New Bridge Street direct to Northumberland Road, and so over Route D to the Showyard. The normal cartage from Forth and Trafalgar Docks was by horses, of which 215 were engaged at the busiest time. To keep an effective control on the movements of vehicles, a control office was established on the Show ground, and cartage was operated by a system of card control, very similar to that of train control.

A noteworthy feature was the employment of a petrol-driven tow-motor to propel heavy vehicles up the severe gradients from the cattle docks to the town and again from Barras Bridge up to the Showyard. In addition, a large number of trace horses were employed. The tow-motor had been employed in assisting heavy loads up from the quay side to the streets on the higher level. It was fitted with a broad wooden buffer at each end, and for this occasion instead of being employed as a tow it was used to push the buffer, enabling it to make contact with the rulley without damage

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either to the vehicle or the motor, with the result that the horses were able to get up quite comfortably with very heavy loads instead of straining at their collars as would normally be the case.

The organisation of the departure, from the cartage point of view, required very careful preparation. The time allowed between the closing of the Show and the departure of the specials was extremely limited, and traffic, moreover, had to be worked through the crowded Newcastle streets on Saturday evening. There was in addition the complexity of the Showyard and the collection of exhibits for a large period in the dark. One special difficulty was created by the very large number of pigs, the exhibits of which totalled about 1,000—it was the biggest show of pigs at the Royal—and nearly all of them were handled in crates.

Summaries of special live-stock trains show that on Saturday eight empties were sent from the marshalling sidings at intervals to Forth, where loading went forward at three docks, and these were despatched at about half-hourly intervals until midnight. Beginning at 1.30 on Sunday morning, 24 were dealt with, there being an interval between 10 o'clock, when the train going for West Durham left, and 4 o'clock, when the Great Western special was despatched via Leeds. Work was continued through the night, and on the Monday morning 12 trains were despatched. Five specials were forwarded to the Southern Railway, 21 to various sections of the London and North Eastern Railway, 8 to the Great Western, and 9 to the London Midland and Scottish, divided fairly evenly between the various sections. Exchanges with the Great Western were mostly made via Leeds or the Great Central section; with the London Midland and Scottish via Leeds or York or via the Swinton and Knottingley line, York being the exchange point also with the Great Northern and Great Central sections of the London and North Eastern, and Berwick and Hexham for the North British.

In addition to the telephonic communication it was also necessary to make special provision for the staff concentrated at Newcastle, and accordingly at Forth a train of third-class carriages was furnished with sleeping accommodation for the men. A train of four dining cars with two kitchens was provided in the sidings to serve meals to them. A facility in the Showyard which was much appreciated was a mess-room specially set apart for serving meals to all railway men, and during Saturday and Sunday nights, while the despatch of stock was going on, a horse-van worked round the Showyard supplying coffee and sandwiches to the men in addition to the fixed meals. It was also necessary to provide baiting stables on the show-ground for the horses, and additional stabling for those brought in from distances was provided at the goods yards.

All the stock trains were received at Forth in three docks, and as soon as a train was unloaded, before it was removed from the docks to stand at the sidings, it was cleaned and then removed to Low Fell or Heaton. The Heaton trains passed from Forth through the Central station, while those for Low Fell proceeded back over the river by Scotswood Bridge. Extensive shunting facilities exist at Low Fell, and those at Heaton were also sufficiently ample for the purpose of marshalling the live-stock specials. By adaptation of the extension now proceeding at Heaton, seven or eight very long sidings were obtained there, and these were found better for general purposes than the new unfinished portion of the rearranged yard. The ordinary goods traffic was transferred from the marshalling sidings to the other side. Special permission was given by the Ministry of Transport to use two of the goods lines outside Central station for passenger traffic, under special regulations, to Manors and Jesmond stations, where much of the excursion traffic was worked. The ordinary train services were considerably augmented; 46 excursion trains were arranged, some of which had to be run in duplicate, while in addition return journey tickets at a single fare were offered to the public on days when no excursions were arranged.

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Locomotive and Train Working in the latter part of the 19th Century.

MIDLAND AND GREAT NORTHERN JOINT RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

A SHORT but very important addition to the Eastern and Midlands Railway was constructed in 1884–5, and opened in January 1886. This was a straight loop line from South Lynn to Bawsey sidings. Hitherto there had been no connection by means of the company's own road between the "lines west," and "lines east" of Lynn. All trains, passenger and goods, had to go into Lynn over the Great Eastern, and thence out again over another section of the same company's line. The new line was 4½ miles in length, and by cutting straight across country to Bawsey, shunted the town of Lynn on to a siding as far as the Eastern and Midlands was concerned. From this time all trains travelled direct between the western and the eastern divisions. A new station, South Lynn, was opened, at which main-line trains stopped, and a short branch train worked between the new station and King's Lynn. The Midland trains from Peterborough, after stopping at South Lynn, also ran through to King's Lynn. The old line from Bawsey into Lynn on the eastern side was closed. The new loop became of added importance after the opening of the extension to Cromer Beach in 1887, for a service of through fast trains during the summer months was instituted between King's Cross (Great Northern Railway) and Cromer via Peterborough and South Lynn. This service would have been practically useless, had the through trains been obliged to make a détour via Lynn over the rival Great Eastern metals.

The great drawback of the new Cromer line was, and is, the necessity for reversing at Melton Constable. The main line from west to east, that is to Norwich and Yarmouth, runs straight through Melton Constable, but the Cromer line leaves this station on the west side, and only attains its easterly direction after rounding a long and severe curve.

Reversing stations of this sort were a feature of the Eastern and Midlands. The awkward one at Lynn was certainly eliminated in 1886 by the direct line described above, but the one at Spalding existed until 1893.

Handicapped though it was by long stretches of single line, nevertheless the old Eastern and Midlands made plucky efforts after 1887 to compete with its powerful rival the Great Eastern. It instituted the present service of through expresses from Peterborough to Norwich and Cromer, though, strictly speaking, these improved services date from the taking over of the lines west of Lynn by the Midland and Great Northern companies.

The formation of the present joint line was completed in two instalments. An agreement was drawn up between the Eastern and Midlands Company and the Midland Railway for the sale to the latter railway of the Peterborough and Sutton Bridge and the Bourne and Lynn lines. The Great Northern naturally objected to being left out, and eventually it was agreed that the Midland and Great Northern should jointly take over all the Eastern and Midlands' lines west of Lynn. Thus was formed in 1889 the first portion of the present joint railways. The working of the lines remained practically as before, in that the Midland worked most of the Peterborough–Lynn trains, and the Great Northern the trains between Bourne, Spalding, and Lynn. But in addition to the four stopping trains in each direction, there were two through expresses each way between Peterborough, where they connected with Great Northern London trains, and the Norfolk coast resorts. Each of these trains was

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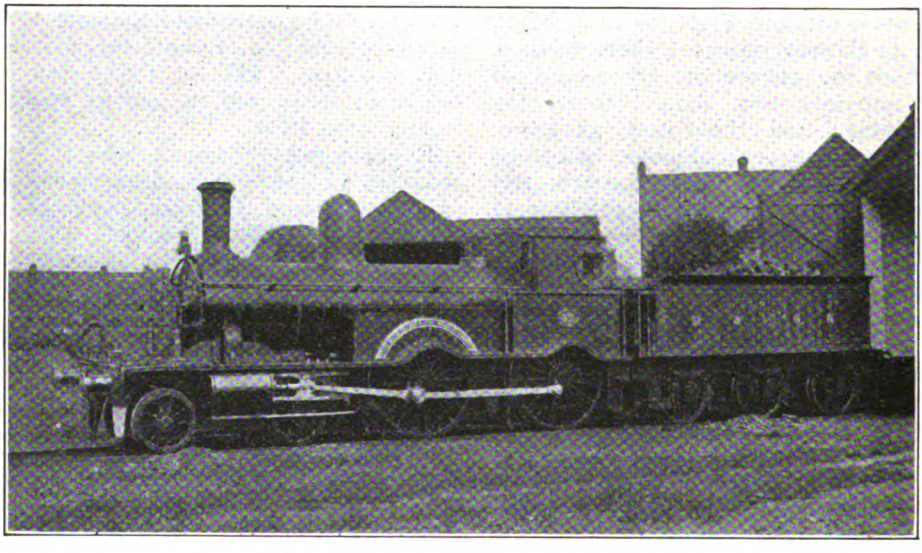
timed between Peterborough and South Lynn (37½ miles) in 63 min., with stops at Wisbech and Sutton Bridge. It should be added, in estimating the merit of these runs, that nearly the whole of the distance was at that time single line. At Murrow the line crosses the Great Northern and Great Eastern joint railway by a level crossing.

East of Lynn the Eastern and Midlands still remained and worked its lines as an independent company for a few years longer. The best train in an eastward direction in 1891 was a continuation of one of the Peterborough fast trains and left at 8 p.m., and reached Norwich at 8.45 p.m., with one stop at Whitwell. On Mondays and Thursdays there were also through fast trains between Cromer and Yarmouth, and on Sundays there were express trains in each direction between Lynn and Yarmouth. Leaving Yarmouth at 6.45 p.m. the return train reached King's Lynn at 9.28 p.m. with five regular and two conditional stops, the distance being 75¼ miles.

The whole of the fast train service was worked by the 4-4-0 outside cylinder engines Nos. 21 to 35.

In 1893 the whole of the eastern section



4-4-0 LOCOMOTIVE No. 32 (Series 21–35).

Built by Beyer, Peacock & Co., Ltd., 1887-8. Coupled wheels, 6 ft. diam. Cylinders, 17 in. by 24 in.

South Lynn at 1.2 p.m., arriving at Melton Constable at 2.8 p.m., distance 31¾ miles. This train had a portion for Cromer (arr. 2.47) and another for Norwich (due 2.55). The evening fast train ran from South Lynn to Fakenham, 24 miles, in 36 min. The best run on the line was done in the opposite direction by the 12.35 p.m. from Melton Constable, which covered the 31¾ miles to South Lynn without stopping, in 55 min., a really good performance over single line.

The company was also enterprising enough to run fast trains between Cromer and Norwich. The evening return express left Cromer at 7.25 p.m., Melton Constable was also taken over by the Midland and Great Northern railways, and since then the allocation of the departments has been similar to that of the Somerset and Dorset Joint Railway, in that the Midland controls the locomotive department from Derby, and the permanent way and engineering department is supervised by the Great Northern Railway. But Mr. William Marriott, M.Inst.C.E., who was engineer and locomotive superintendent of the old Eastern and Midlands Railway, still retains the local and real control over both departments.

In 1893 two other lines of great importance were opened. The first was the

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Midland line from Saxby to Bourne, of which the portion from Little Bytham signal-box, where the line crosses the Great Northern main line, to Bourne, a distance of five miles, was handed over to the Midland and Great Northern Joint Committee, as part of the joint lines. This line gave the Midland a direct route to the joint railways from Leicester, Birmingham and the Midlands, instead of the old roundabout journey via Stamford and Peterborough.

At the same time the Spalding reversing angle was cut out, just as the one at Lynn had been eliminated seven years before. This was done by making a new line 1¼ miles long from Cuckoo Junction, south west of Spalding, to Welland Bank Junction, south-east of the same town. This line enabled trains to run right through from Bourne to Sutton Bridge and South Lynn.

For a time after the taking over of the eastern section, the lines had to be worked as before, but an order was given to Sharp, Stewart and Co., of Glasgow, for 26 new 4-4-0 express engines, which were delivered in 1884. These engines were of Mr. S. W. Johnson's Midland design with 6 ft. 6 in. coupled wheels, 18½ in. by 26 in. cylinders, and 160 lb. pressure. They are Nos. 1 to 7, 11 to 14, 17, 18, 36 to 39, and 42 to 50, of the Midland and Great Northern Joint line. When new they were delivered by the makers to Derby, where they ran their trial mileage on Midland local trains, after which they were sent to Melton Constable. They were painted yellow, of a similar shade to the colour of the Brighton engines, but with brown panelling and black lines.

As soon as there were sufficient engines, the locomotive working of the lines west of Lynn was taken over by the joint committee, and the Midland engines, which had been stabled at Lynn since 1866 for the Peterborough trains, were removed. Similarly the Great Northern engines disappeared from the Bourne and Lynn section.

In 1896, 15 more engines were added to the stock. Of these, Nos. 51 to 57 were 4-4-0 engines exactly similar to those previously mentioned, and were also built by Sharp, Stewart & Co. But Nos. 58 to 65, by Neilson and Co., were 0-6-0 goods engines of Mr. Johnson's standard Midland design with 5 ft. 2½ in. wheels, and 18 in. by 26 in. cylinders. These were the first suitable goods engines to be used on the line, for hitherto the goods traffic had been worked by the four coupled passenger engines. Similar 0-6-0 goods engines Nos. 66 to 73 were built in 1899 by Kitson and Co., and the same year saw the appearance of seven more of the standard 4-4-0 express engines, Nos. 74 to 80, which were built by Beyer, Peacock & Co.

Most of the old locomotive stock, except the seven Hudswell, Clarke 4-4-0 tank engines, and the old 4-4-0 outside cylinder passenger engines, had retired to the oblivion of the duplicate list, or had been sold or scrapped.

The principal engine sheds are at Bourne, Spalding, South Lynn, Melton Constable, Norwich and Yarmouth. There is also a small shed at Cromer. At Peterborough the Midland and Great Northern engines are stabled at the Midland shed, and at Bourne a considerale number of Midland engines are quartered in the joint shed. The Great Northern also stables a few engines in the joint shed at Spalding.

For some years after 1893 the carriage stock was replenished with six-wheeled coaches handed over from the stocks of the two owning companies. The result was a somewhat piebald appearance of many of the trains. There were a number of the teak-panelled coaches of the Eastern and Midlands Railway, but these were of a different shape from the Great Northern six-wheeled coaches with rounded roof corners. The coaches furnished by the Midland retained the well-known red colour. The only change made was to letter all of them M. and G.N. and then mix them together in the same trains.

Before the end of the century the train service on the joint railway had developed into an excellent one. The fastest train was the special express which left London (King's Cross) at 1.10 p.m. and ran during the summer months only. As long ago as 1898 this train left Peterborough, where it was taken over by one of the joint 4-4-0 engines of Mr. S. W. Johnson's design, at 2.47 p.m., and ran thence the 68¼ miles to Melton Constable (due 4.22 p.m.) without a stop in 95 min. This gives the excellent running average of 43·1 m.p.h.

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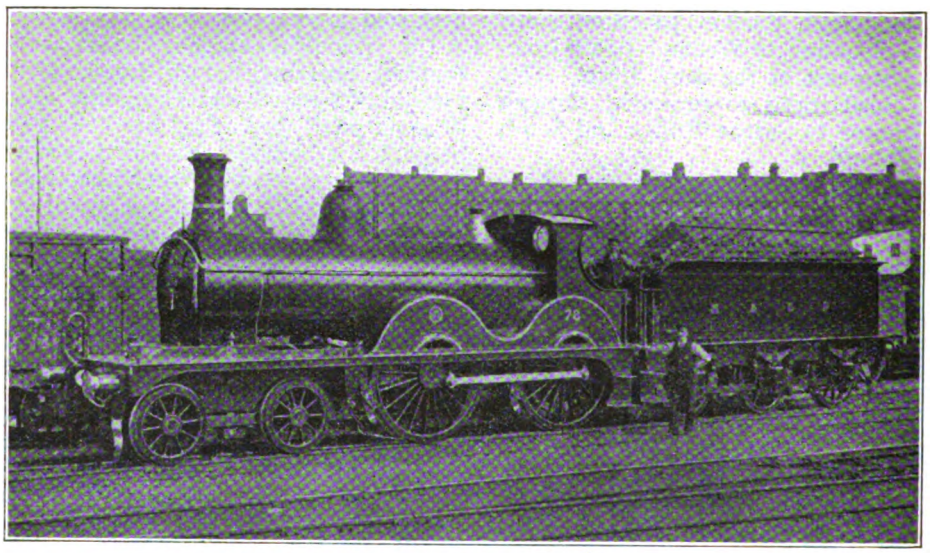
over a line most of which was single, and was probably the best "single line" running in the Kingdom. There was also an up train with similar timing. The afternoon express, the 4.40 p.m. from Peterborough ran all the year round, and covered the 27½ miles to Sutton Bridge in 42 min. This train ran from South Lynn to Melton Constable (31¾ miles) in 55 min. with a one-minute stop at Fakenham Town.

The two Midland expresses from Birmingham and Leicester were worked to Bourne by Midland engines from Leicester and Birmingham sheds respectively, and through to Leicester, is a product of the present century.

On the other hand, Midland passenger engines did not work east of Bourne, though cattle trains were worked on certain days of the week by Midland goods engines between Bourne and Lynn.

The locomotive and carriage works are at Melton Constable, where a few new shunting engines have been built to Mr. Marriott's designs. These are 0-6-0 side-tank engines with outside cylinders 14 in. by 20 in. and 3 ft. 7 in. coupled wheels. They were constructed from 1897 onwards



STANDARD 4-4-0 ENGINE (MIDLAND TYPE), No. 78.

Designed by Mr. S. W. Johnson and built 1894–1900. Coupled wheels, 6 ft. 6 in. diam. Cylinders, 18½ in. by 26 in.

then taken over by the joint committee's engines. The run from Bourne to South Lynn (34 miles) was performed in 48 min., an average speed of 42½ m.p.h.

Direct trains were run between Norwich and Cromer. The 2.10 p.m. from Norwich (City) ran through to Sheringham (arr. 3.16 p.m.) without stopping, a distance of 32½ miles. This train ran four days a week, including Sundays.

The "Joint" engines did not then work over the Midland west of Bourne. This working, by which Norwich engines have run the Midland expresses right and originally had duplicate numbers 1A, 17A, &c., but afterwards became Nos. 93 to 98. There are now two others, Nos. 15 and 16, of the same class.

The only other engines to be mentioned are 12 0-6-0 engines Nos. 81 to 92. These are of Mr. Ivatt's Great Northern design (1101 class), and were built in 1900 for the latter railway by Dübs & Co. As this line then had more engines than it required, it was arranged to hand some of those under construction to the joint line. These engines have 5 ft. 1½ in. wheels and 17½ in. by 26 in. cylinders and 170 lb. pressure.

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Fruit Traffic on the Great Eastern Section of the London and North Eastern Railway.

ALTHOUGH the term "the Garden of England" is usually claimed for other areas, a large part of the fen country, embracing South Lincolnshire, West Norfolk, Huntingdonshire, Cambridgeshire and the Isle of Ely, has within the last 30 or 40 years developed very greatly as a fruit-growing district. This area has, in fact, always been regarded as favourable for agricultural purposes, and that it has been found so suitable for fruit cultivation, including a large proportion of the better-class qualities, is attributed partly to the richness of the loam soil and to the flooding which so much of it has received in the past and occasionally in more recent years.

As a result, a large number of East Anglian stations have become important centres for a considerable and ever-growing traffic in fruit of various kinds, and in the November, 1922, RAILWAY MAGAZINE we dealt with the traffic thus conveyed by the Midland and Great Northern Joint Railway. The same area is, however, served by the Great Eastern section of the London and North Eastern Railway, which also has many lines which are similarly centres for such traffic. There are, in fact, about 40 stations on the Great Eastern system (as compared with 19 on the Midland and Great Northern Joint line) which deal in the respective seasons with fruit traffic on a large scale. A few of these are found in more southern counties, as, for example, Sawbridgeworth and Harlow in Essex, and there are also fruit areas in Suffolk and Norfolk, but the great fruit area is that served by the Cambridgeshire and Isle of Ely lines, West Norfolk and South Lincolnshire. The principal stations concerned are as follows :—

Cambridge and March via Ely.—Waterbeach, Ely, Black Bank, Manea, Stonea and March.

Cambridge and March via St. Ives.—Histon, Oakington, Long Stanton, Swavesey, St. Ives, Somersham, Chatteris and Wimblington.

March and Peterborough.—Whittlesea and Benwick.

March and Magdalen Road.—Coldham, Wisbech, Emneth, Smeeth Road, Middle Drove, Magdalen Road, St. German's Siding and King's Lynn.

Ely and King's Lynn.—Littleport and Hilgay.

Ely and St. Ives.—Stretham, Wilburton, Haddenham, Sutton, Earith Bridge and Bluntisham.

Cambridge and Mildenhall.—Burwell, Fordham, Isleham and Mildenhall.

Ely and Thetford.—Shippea Hill, Padnal Siding and Lakenheath.

Ely and Newmarket.—Soham.

March and Sleaford.—Guyhirne, Murrow, French Drove, Postland, Cowbit, Pinchbeck, Gosberton, Donington Road and Helpringham.

Cambridge and Mark's Tey.—Bartlow.

London and Cambridge Main Line.—Harlow and Sawbridgeworth.

The above analysis of the stations principally concerned indicates how far-reaching the fruit-growing industry has become. In the Cambridge area alone, there are some 30,000 to 40,000 acres exclusively devoted to fruit cultivation, and the greater part of this has been developed within the last 20 or 30 years, previous to which much of it was used mainly for root crops and relatively low-grade products. Many other stations, however, contribute their quota. At several stations there is also an inwards fruit traffic, notably at Histon, where Messrs. Chivers' jam factories are situated. There are also jam-making and other establishments requiring fruit supplies at Ely and other places. The Tiptree fruit-growing industry, and the jam and other factories in the vicinity served by the Kelvedon and Tollesbury Light Railway, may also be mentioned.

As showing the volume of traffic, the following particulars of traffic forwarded

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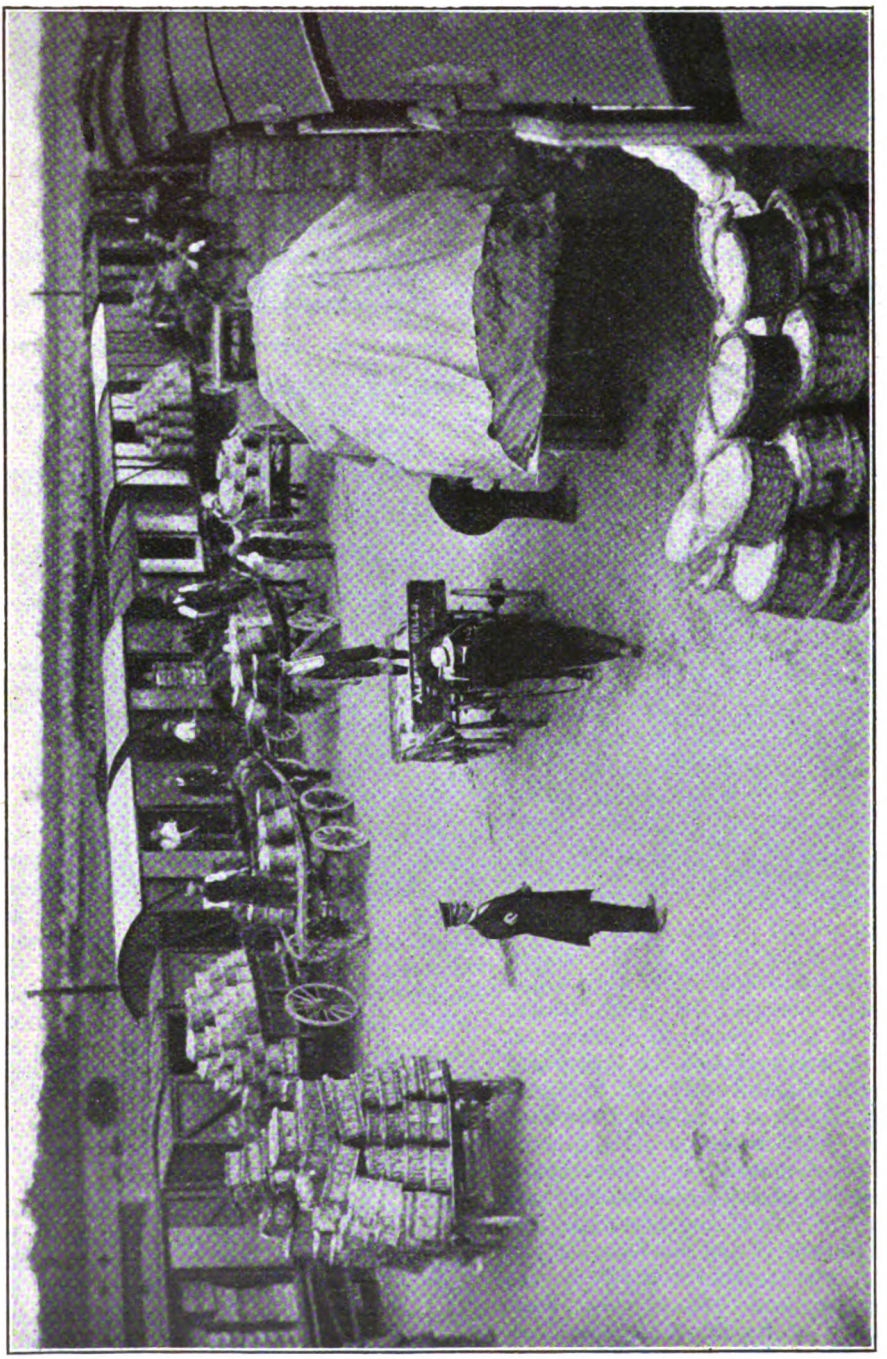

By courtesy of the "Cambridge Chronicle"

LOADING FRUIT AT LONG STANTON, LONDON & NORTH EASTERN RAILWAY, GREAT EASTERN SECTION.

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June to October, 1922, at the seven busiest stations may be quoted :—

	Goods.	Passenger.
Wisbech ..	13,664	1,945
Long Stanton ..	2,823	305
Oakington ..	2,505	252
Smeeth Road ..	1,601	388
Emneth ..	1,417	427
Somersham ..	1,672	251
Shippea Hill ..	1,259	—

The very high figures associated with Wisbech are partly due to the fact that the traffic of the Wisbech and Upwell Tramway is there brought on to the main line system, though the town is a very big centre on its own account. The tramway has, however, contributed in no small measure to the development of the fruit industry in the Wisbech area, and indirectly has encouraged its extension into the districts around.

The Wisbech and Upwell Tramway, which runs southwardly from Wisbech station *via* Elm Bridge, Boyce's Depot, Outwell Basin and Outwell Village to Upwell, a distance of 5 miles 72 chains, was first projected in 1873, but it was not until 1881 that the necessary funds could be raised. In that year an Act was obtained and the line was opened on August 20, 1883, from Wisbech station to Outwell station, and to Upwell on September 8, 1884. Although the line was constructed before the Light Railways Act of 1896 was passed, it is of light railway character, partly running alongside the public road, and having a number of intermediate stopping places where trains call as required, and operated by locomotives which are entirely covered in and restricted to a maximum speed of 8 miles an hour, while tickets are issued and collected by travelling conductors. At the depôts or stations there is a waiting room, accommodation for the man in charge, goods office, and several goods sidings, with space to permit of road vehicles being placed alongside the wagons for loading or unloading. At the Upwell terminus the accommodation is as extensive as at many fairly busy main line stations, with warehouse and store, and six siding roads in the goods yard. Where running on the public roads, the rails are fitted with guard rails and embedded in the ballast, so as to offer no obstruction to road vehicles crossing. At the Wisbech station a side platform of a height suitable for the tramcar-type vehicles used on the tramway is provided.

The normal daily service consists of seven or eight passenger trains each way, and they are permitted to convey not more than two through trucks between Wisbech and Upwell, but not intermediately. There are also five regular goods trains scheduled each way daily, and during the fruit seasons these have to be considerably increased. Passenger trains are not permitted to exceed the equivalent of nine vehicles, but 10 or even more four-wheeled vehicles are taken on the goods trains. Coal traffic is usually worked separately, the standard load being four fully-loaded wagons in winter and five in summer. The maximum grade is 1 in 32. Five or six locomotives are usually in steam daily.

The fruit seasons are distributed substantially as follows: May and June, gooseberries; June and July, strawberries; July, currants and raspberries, the latter extending also into August; July to September, plums; and July to Christmas, apples. The fruit is forwarded by both passenger and goods trains, and from the Wisbech area as many as 120 passenger train vehicles have been loaded in one day, mainly for the north, and as many as 300 goods wagons to go forward by goods trains. Generally speaking, the fruit is not loaded until the afternoon, the rush period being between 3 and 4.30 p.m., at which time the yards of the stations concerned—many of them in the ordinary way apparently quiet little country stations —are the centre of much bustle as road vehicles of all kinds come in and transfer their loads to the wagons in waiting. The latter are classified as far as possible for principal destinations, but a degree of re-marshalling is generally necessary, for which purpose Whitemoor sidings, just north of March station, are principally utilised for traffic proceeding *via* the Great Northern and Great Eastern Joint line to northern centres. However heavy the traffic may be, it is, nevertheless, all landed early the following morning in the markets of London, Liverpool, Manchester, Sheffield, Hull, Leeds and Halifax, a considerable proportion also going forward to Edinburgh and Glasgow. At busy times, five or six trains, composed entirely of passenger traffic vehicles and

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run on fast schedules, are operated daily, while as many goods trains, each consisting of from 45 to 60 wagons, will convey traffic suited to their lower speeds or to the shorter journeys to be made. Fruit traffic conveyed by goods trains in the June to October period, 1922, amounted to 36,572 tons, and by passenger trains, 5,343 tons.

The fruit growers adopt different methods of packing the various classes of fruit for rail transit. Gooseberries, when green, are despatched in bags weighing 28 to 56 lb., whilst in a riper condition they are forwarded in chip baskets of 6 lb., or in sieves of anything from 12 to 24 lb. Currants are loaded principally in chips of 10 lb., or sieves of 24 lb., but occasionally in trays of 12 lb. The favourite method of packing strawberries is the 4-lb. chip baskets, which are usually loaded in the wagon tier upon tier, but even this delicious fruit, when forwarded for jam purposes, gets a more crude handling by being placed in tubs. Raspberries are also conveyed in tubs or chips, whilst plums are packed in sieves, half flats, chips and crates. Apples are usually forwarded in sieves of 21 lb., flats of 42 lb., or what are known as bushels of 21 lb.

The railway company makes up through vans or wagons, as the case may be, for all the largest centres as named above, as well as many others, and in the course of a season it will be readily understood that the number of individual packages handled will total several millions, and this necessitates the drafting in of increased staff to many of the stations where the traffic is particularly heavy. As many as 34 clerks and 100 of the out-door staff augmented the normal staff during the 1922 season, and even with this additional number, platelayers were occasionally called upon to assist in loading during the rush periods.

The railway company offers special facilities for fruit pickers to enable them to go into the district during the season, by allowing cheap rates on the basis of a single fare and a third for parties of 12 and upwards, and large numbers avail themselves of this concession.

In connection with the working of this traffic, special arrangements have, of course, to be made by the operating department. These include the scheduling of additional vans to be attached to ordinary trains as required according to destination, including provision for traffic passing on to other lines at Huntingdon, Peterborough, Lincoln, Doncaster, &c. The distribution of empty wagons and vans at various centres and to individual stations is, naturally, a matter calling for special attention, as also the provision of locomotives and engine and train men. Attention has also to be given to the frequent need for running additional or relief fruit trains which cannot be arranged beforehand. Beside the through traffic a number of transhipping vans are usually required in view of the fact that much of the fruit is consigned in small loads to consignees all over the country, and these may emanate from consignors equally distributed throughout the fruit area.

Although not covered by preceding references, there are also many stations in Norfolk and Suffolk which during the seasons provide sufficient fruit traffic to call for accommodation either by vans and wagons attached to the ordinary passenger or goods trains or occasionally by specials. Thus, it is sometimes necessary to run fruit traffic specials from lines in the Norwich district to be worked to March or Peterborough and there combined with other trains. The cucumber, tomato and grape traffic from stations near London, especially Cheshunt and Broxbourne, may also be mentioned. By rail this is mainly for northern destinations. Traffic for Scotland and northern towns has frequently to be loaded in dual-fitted vehicles.

As showing the character of the traffic worked from March or Whitemoor northward, a series of trains is booked to arrive during the fruit season at Whitemoor at 6.3 p.m. from Magdalen Road, at 6.8 p.m. from Upwell, at 6.18 p.m. from Wisbech, at 6.25 p.m. from Cambridge, and at 6.35 p.m. from Norwich. These go forward as three trains: at 7 p.m. to be transferred to the Great Central section at Pyewipe Junction, and at 7.12 and 7.25 p.m. for Doncaster and destinations beyond.

Traffic conveyed by goods trains requires, of course, similar provision. The standard services provide for goods trains centring upon March from all directions, including even the Colchester main line of the Great

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Eastern section, combined to form trains leaving Whitemoor sidings at 3.30, 3.45, 6.15, 7.30, 8, 8.15 and 8.25 p.m. All these arrangements are necessarily duplicated, or even triplicated, more or less frequently at the heavy periods, while additional trains may have to be run.

As showing the importance of the fruit traffic of this area, the Great Eastern Railway in 1921, in connection with the *Daily Mail* Imperial Fruit Show at the Crystal Palace, held October 28 to November 5, provided a special "Apple Show Express" from King's Lynn to London, routed to serve the principal apple-growing centres. In 1922 three trains were run, provided with restaurant car accommodation. To facilitate the journey across London, through trains in connection were run from Liverpool Street direct to the Low Level station at the Crystal Palace. On Monday, October 30, a train left King's Lynn at 6 a.m. and travelled *via* Wisbech, March and Ely to Cambridge and London, with bookings from the Sutton and Ely line. On Wednesday, November 1, a train left King's Lynn at 5.50 a.m., and travelled *via* March and St. Ives to Cambridge, and thence to Liverpool Street. Bookings were also given from stations on the Great Northern and Great Eastern Joint line connecting at March. On Thursday, November 2, a train left Norwich at 7.30 a.m., with bookings from the Yarmouth-Norwich line, and served principal stations to London *via* Ipswich. On each occasion the train was decorated with oil paintings, attached one in front of the engine and showing a huge apple, though, in 1922, the train was described as a "Fruit Show Express" and not attributed to apples only, while the sides of the tender carried paintings, including reproductions of fruits of many kinds. Flags and other decorations were also employed, and the train was labelled throughout its length "G.E.R. Fruit Show Express." The train proved very popular, being well loaded on each day.

Photo.] **WISBECH STATION.** [*J. F. Gairns.*

Wisbech and Upwell Steam Tram at outside low platform.

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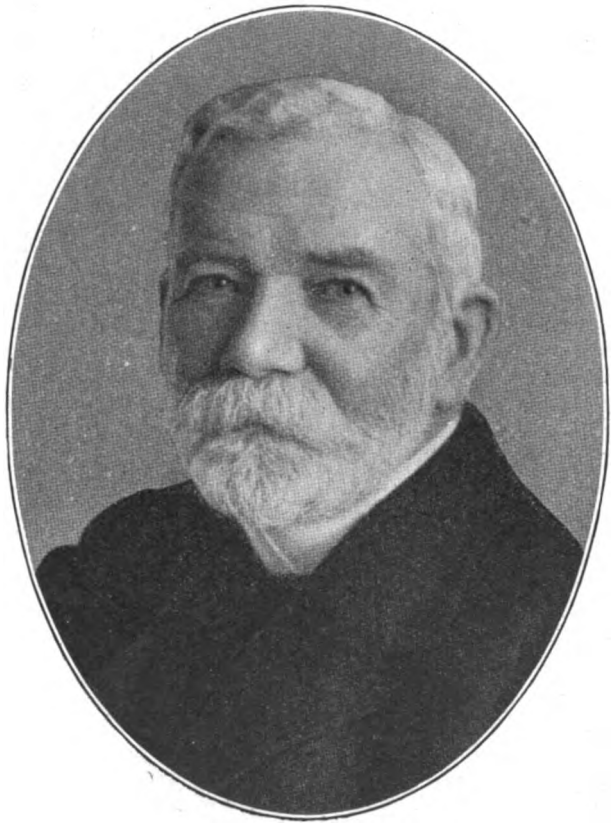
THE RAILWAY PORTRAIT GALLERY.



Elliott] [*& Fry.*

MR. R. W. URIE, M.I.Mech.E.,

Locomotive Engineer,
London and South Western Railway, 1912-1923.

MR. URIE'S retirement removes from active service one of the most able locomotive Engineers in Great Britain. Born in 1854, after suitable education and training, he entered the service of the Caledonian Railway as a draughtsman. Later he became Chief Draughtsman and subsequently Works Manager of the company's works at St. Rollox. In 1897 he became Works Manager in the Locomotive Department of the London & South Western Railway, then situated at Nine Elms. He was appointed Locomotive Engineer in 1912. Mr. Urie is the inventor of the "Eastleigh" superheater and designed the modern locomotives of the London & South Western Railway which are illustrated in the frontispiece to this issue of THE RAILWAY MAGAZINE. These locomotives, of distinctive appearance, rank among the most advanced and efficient working in the British Isles.

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Agricultural Light Railways in the Argentine.

IN agricultural districts, where roads are bad and haulage has to be performed by horse-power, the cost of transporting commodities for long distances is extremely heavy and after a certain mileage becomes prohibitive. This transport difficulty in its worst phase is largely met with in newly-settled districts. The belt of land on either side of the railway is soon under cultivation, and, as the district becomes more developed, an outer zone is added. Transport of produce from this outer zone is effected by horse-hauled vehicles. The districts beyond the outer zone cannot in the usual way be settled until a new railway, giving the district transport facilities at least equal to the outer zone, is constructed. The immense cost of railway construction and material prevents the building of new standard railways to such districts. Such, briefly, is the position in the Argentine, where proposals to provide transport facilities for these outside districts have been under careful consideration for some time.

The laying down of railways, constructed of extremely light portable permanent-way, and special vehicles on the Decauville system, suggested a solution of the problem, but the post-war cost of such apparatus makes the expense prohibitive on the usual basis. For the service of the armies in France during the Great War a considerable mileage of Decauville railway, together with suitable rolling-stock, were employed. After the war, the material became surplus, and the Buenos Ayres Great Southern Railway saw at once that the acquisition of this railway material would enable it to provide at a moderate expense, transport facilities suitable for developing agricultural districts some distance from the railway.

The map on page 216 shows the agricultural light railways on the Decauville system already provided by the Buenos Ayres Great Southern Railway. The gauge of the lines is 0.60 metre (just over 1 ft. 11½ in.), whilst the weight of track material is only 20 lb. per lineal yard. Slightly over 125 miles of track were purchased, and, early in 1921, a commencement was made to utilise part of it, by the construction of Decauville railways from Balcarce and Orense stations on the Buenos Ayres Great Southern Railway system. Portions of these portable railways were completed in time to enable parts of the crops—mostly potatoes in the Balcarce district, and grain around Orense—to be transported by them to the main line.

Such was the success obtained in attracting traffic to the standard-gauge railway, by means of the Decauville lines, that immediate steps were taken to lay down similar lines from the main line at Copetonas and Cascallares. To complete these lines, additional track was obtained, and the whole of the Decauville lines were in working order in time to carry the crops last year. The lines in operation comprise (including sidings): Balcarce district, 45½ miles, Orense district, 43¾ miles; Copetonas district, 28 miles; Cascalles district, 33¾ miles; a total of 151 miles of portable railway.

In two of the districts where the lines are laid the country is fairly level, but in the other two it is undulating. The maximum gradient the loaded trains have to surmount is 1 in 150, but in the outward direction, from the main line, gradients of 1 in 80 are to be found; the sharpest curves have a radius of 163 ft. At first it was proposed to lay the lines along the roads where such existed, but upon consideration this plan was abandoned, as it was recognised that damage to the railway might occur from the heavy camp carts using the roads, some of these vehicles being drawn by as many as 25 horses, and also from straying cattle. As a consequence, the lines were taken across country. No signals are employed, nor are there any stations. The lines are single, but crossing loops are provided every 3¼ miles. These loops are utilised for loading the trucks, and in addition, dead-end sidings are provided for the same purpose at points to meet the requirements of the farmers. The average speed on

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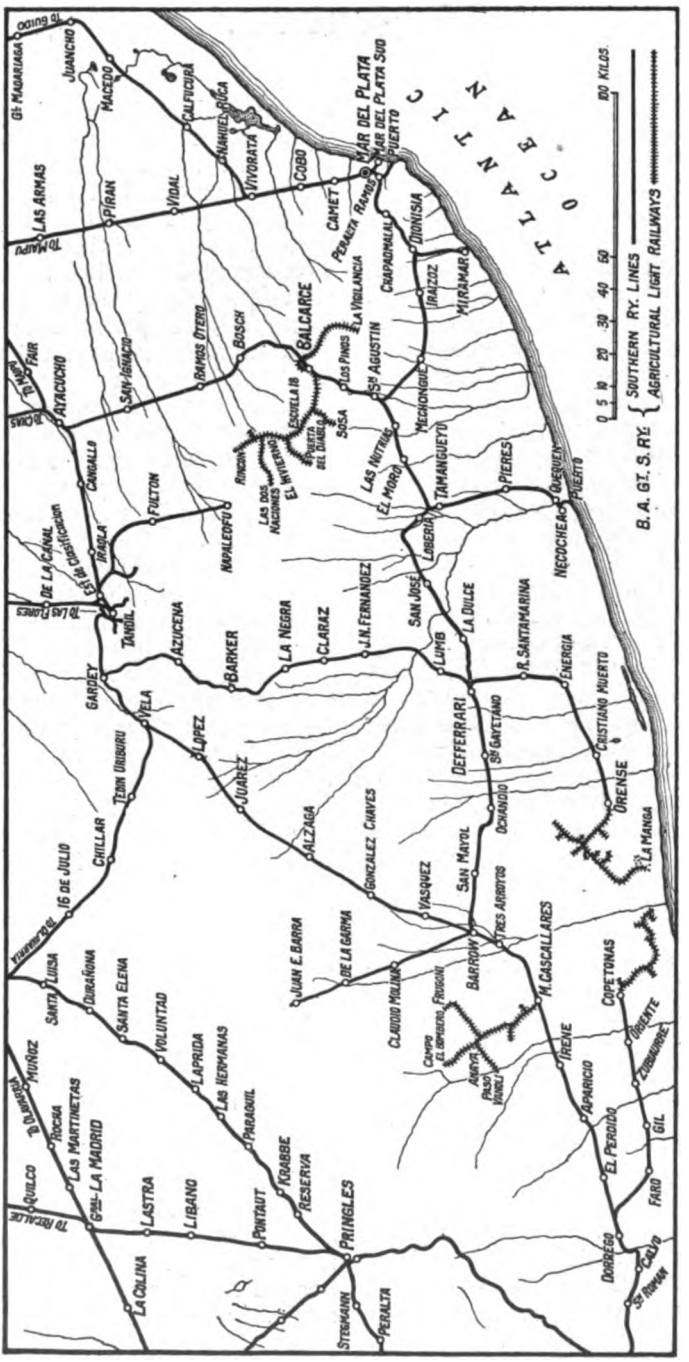

MAP SHOWING AGRICULTURAL FEEDER LINES ON THE BUENOS AYRES GREAT SOUTHERN RAILWAY.

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SIDINGS AND POTATO SHEDS IN BALCARCE STATION YARD. BUENOS AYRES GREAT SOUTHERN RAILWAY.

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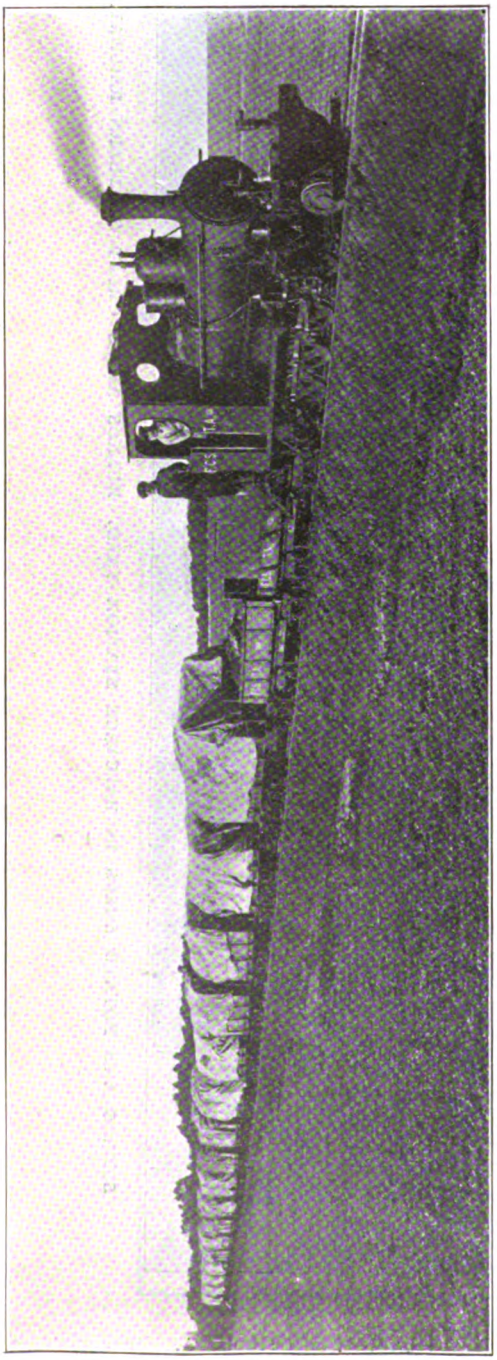
these Decauville lines is 6¼ miles an hour.

Referring to the lines in the four districts: the Balcarce system consists of the main Decauville line from Balcarce station on the standard system of the Buenos Ayres Great Southern Railway and proceeds in a westerly direction to El Rincon, a distance of 32 miles. There are branches—to El Recreo, 4⅜ miles, towards Puerto del Diabolo, 5 miles, etc. These light railway lines enable the produce of 37,000 acres (28,250 potatoes and 8,750 grain) to be conveyed cheaply and expeditiously to the main line at Balcarce.



POTATO TRAIN DRAWN BY "HUNSLET" STEAM LOCOMOTIVE.

The Decauville railway from Orense station serves 50,000 acres of grain and linseed land. The principal line runs westward from Orense station for a distance of nearly 12½ miles. At about 8⅞ miles from Orense there is a branch to the north-east, 8½ miles long with two feeder sidings, whilst a short distance further along the principal line a branch runs out in a south-westerly direction. This branch has two feeder sidings; its length is about 15 miles.

In the Copetonas district 62,500 acres of wheat and oat lands are served by the light railway which starts from the terminus of the standard-gauge branch of the Buenos Ayres Great Southern Railway at that place. This Decauville railway is 23¾ miles in length, runs in a south-easterly direction, and has five feeder sidings (or short branches).

The Cascallares system serves 87,500 acres (wheat, barley, oats and linseed). The line leaves the standard-gauge section of the Buenos Ayres Great Southern Railway in a northern direction, and is 25 miles in length; it has various feeder lines and branches. The map shows two of these as being of fair length.

For carrying traffic on these four Decauville sections, the Buenos Ayres Great Southern Railway has provided a variety of rolling-stock, viz. :—

No.		Total Capacity. Tons.
1,350	1-ton trucks	1,350
200	3-ton trucks	600
225	6-ton converted bogie trucks	1,350
200	6-ton " Hudson " bogie trucks	1,200
64	5-ton " Koppel " bogie trucks	320
2,039	Total No.	Tons 4,820

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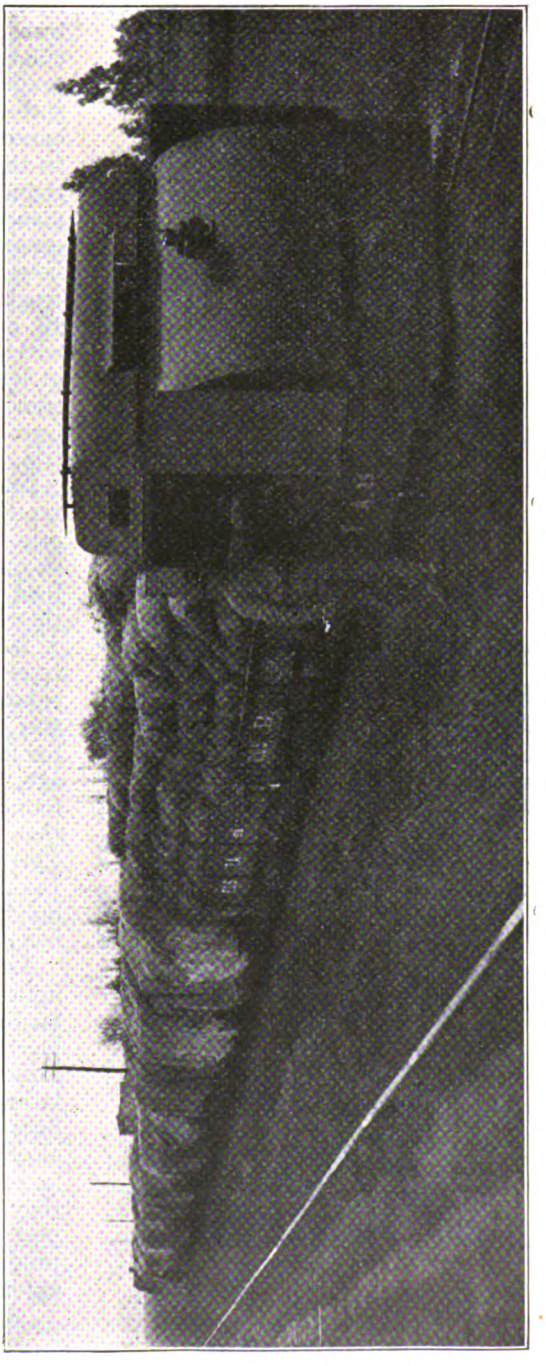
The 6-ton converted bogie trucks, although their number is but 225, have a total capacity equal to the 1,350 1-ton trucks. The story of the evolution of these trucks is worth recording. It affords interesting evidence of the application of mechanical engineering ingenuity to the solution of an important problem. The conversion of 1-ton trucks to the 6-ton bogie trucks was effected in the Talleres shops of the Buenos Ayres Great Southern Railway. Briefly, it consisted in joining together the platforms of two 1-ton trucks and mounting the body on two bogies. In the ordinary way a type of wheel and axle different from those of the 1-ton truck, together with suitable axleboxes, would have been necessary for the converted bogie truck. The expenditure of capital on such material was avoided in an ingenious manner. Ball-bearings of the oscillating type were placed against the boss of each wheel to reduce the bending moment, with the result that the wheels and axles of the 1-ton trucks are quite suitable for the 6-ton bogie vehicles. This plan has produced a vehicle extremely easy to move; trials show that with a load of 8 tons, an effort of only 80 lb. (10 lb. per ton) is required to start one of these trucks. A 3-ton truck requires an effort of 40 lb. per ton (120 lb.) to put it in motion.

The motive power on these Decauville railways is provided by the following:—16 "Hunslet" steam locomotives; 20 20-h.p. "Simplex" petrol tractors; 1 22-h.p. petrol tractor; 10 40-h.p. "Simplex" petrol tractors.

A train composed of 20 converted bogie trucks, of a total weight of 150 tons, of which 120 tons is paying load, can be hauled by a 20-h.p. "Simplex" tractor on the level at 6 m.p.h. The same tractor can haul only a gross load of 50 tons when the train is composed of 3-ton trucks, at the same speed on the level.

Readers of the RAILWAY MAGAZINE will be interested to learn something of transport conditions in the agricultural districts served by the Buenos Ayres Great Southern



POTATO TRAIN DRAWN BY 40-H.P. "SIMPLEX" TRACTOR ENTERING BALCARCE STATION YARD.

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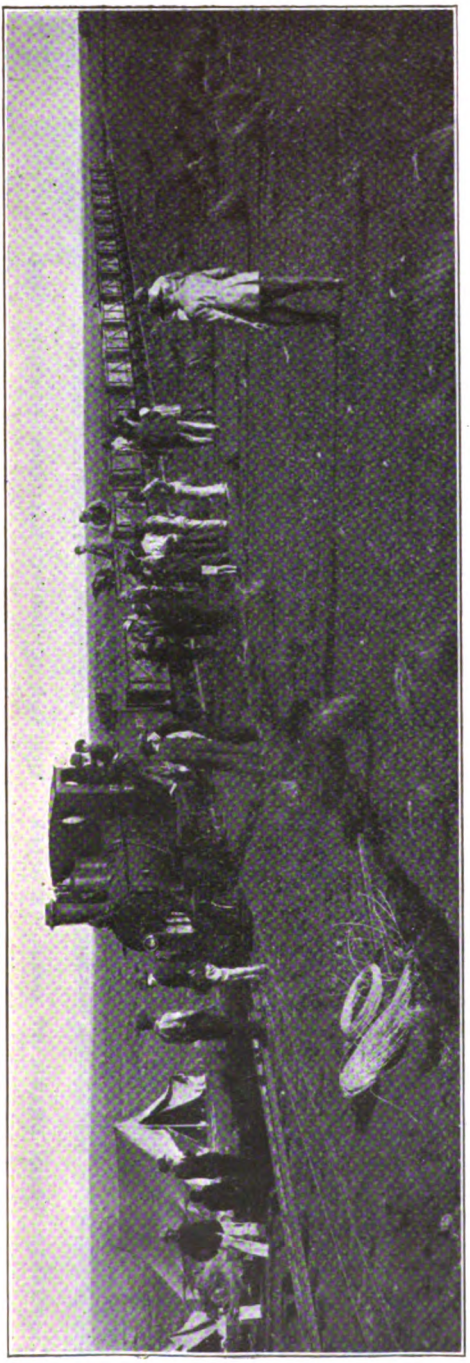

SCENE AT SR. NEWTON'S SIDING, KILOMETRE 38, LOOKING NORTH.

Railway. The average "cart," or farm wagon, employed carries a load of 8½ tons, big teams of horses—frequently as many as 25 for one "cart"—being employed to haul the wagons. The "carts" are in charge of carters who exploit the work of transport to their own advantage, particularly at times when big quantities of produce have to be carted. As already stated, the cost of cartage for distances exceeding 19 miles is prohibitive. Prior to the laying of these light railways, the round trip of a journey of 19 miles to standard railways and 19 miles back occupied from two to three days. Now, however, a Decauville train of 17 bogie trucks conveys 100 tons of produce the 19 miles, and returns for another load within a day. Twelve camp wagons, with at least 180 horses, would be required to convey the same load, and would occupy from two to three days on the return trip.

Another point in favour of mechanical traction is the elimination of the need for providing food for horse teams employed in cartage. The horse forage, as well as food for the carters, had to be carried by the carts in addition to the goods conveyed. A large acreage of the farms had to be reserved for grazing the cart horses; the substitution of mechanical traction enables this land to be employed for raising crops for market. Despite the obvious advantages of the light railways, it has been found that most farmers, for less distances than 15 miles, make use of horse cartage. This means that, in the Argentine, for Decauville railways to be successful, they must serve districts more than 15 miles from the standard-gauge railway.

As an example of the development of light industrial railways to amplify the facilities of a main line railway, and as a means for bringing railways, as it were, direct to the doors of farmers, this installation is worthy of careful study. Such lines offer great possibilities in areas where agricultural activities are conducted on a large scale, and it may be suggested that they may provide a solution of the transport problem in many other places where produce is collected throughout widely extended districts.

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Railway Stock-Taking.

By C. THOMPSON.

AN interesting feature of railway work, not generally known, but nevertheless of considerable importance to the community, is the arrangement whereby railway companies act as warehousemen for merchants and manufacturers.

In most of our large towns and cities the goods sheds are not merely centres for the distribution of merchandise, but are also largely used for the storage of all kinds of articles for the convenience of traders who are themselves not equipped with suitable accommodation for holding goods pending their customers' convenience for taking delivery. In fact the railway companies, by the provision of such warehouses, have greatly facilitated the business of those traders who purchase in bulk and distribute in detail. The goods, of course, travel by rail, either before or after storage, and the companies look to the carriage receipts, even more than the warehouse rent, to remunerate them for their services.

Whilst acting as warehousemen, the railway companies, in order to ensure the safe custody of the goods entrusted to their care, keep a careful inventory thereof in their warehouse books, *i.e.*, the dates of entry and removal, together with the owner's name, trade marks or numbers, &c. Some consignments are ultimately removed without bulk being broken, but others are split up at different times to meet traders' requirements. For instance, a leather merchant has imported a hundred bales of " bends," or bottom leather. A portion only being required for immediate delivery, he requests the company to hold the balance to his " order." In the course of a few days, or it may be weeks or months, he issues instructions for, say, eight bales, to be delivered to Messrs. Smith & Co. Later on, a few more bales are ordered out to another customer, and so on until the whole lot has been disposed of.

In order to check any discrepancies by mis-delivery or from other cause, the railway company takes stock, usually twice a year, of the goods on hand. Assuming the reader has been privileged to accompany the writer on a visit to one of the depôts on the occasion of this half-yearly event, he will probably be astonished on going through the warehouse to see so great a display of merchandise, representing, as it often does, many thousands of pounds' value.

Proceed through the basement first; the heavier classes of goods are chiefly in evidence, including rows of casks of lubricating and other oils, liquid glue, cement, vinegar, hundreds of trusses of leather, rolls of lead, crates of earthenware, potatoes in bags, nuts in bags, spelter, metal scrap, as well as steel and ironwork in various stages of manufacture.

On the next floor miscellaneous articles are stored in even greater variety. Immense quantities of provisions, and fruit in cases, lemons, grapes, condensed milk, sugar, cake (for human consumption) and ditto for cattle food; flour in bags, grain (wheat, oats, barley, maize, &c.), furniture, strawboards, all neatly stacked; paper in bundles, in parcels, and reels for newspaper printing; machinery in cases; hosiery and cotton goods in hampers, cases and bales; rubber in cases; motor tyres; wool (both English and foreign); hops, and yet more leather in bales, trusses and cases, and here are half-a-dozen pieces of unusual length and breadth as well as colour; on investigation it transpires they are really *elephants'* hides.

Those, of course, are only a tithe of what may be seen, and to the casual observer the thought no doubt will occur: " How on earth are all the various lots got into the

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hands of their rightful owners without confusion, or losses taking place?" As a matter of fact there is no confusion, and of the thousands of consignments it is very rarely indeed that a single article is missing when required by the owner. On the goods being taken into stock they are all duly recorded, as already stated, whilst at the same time a tag or label is attached to each article in the consignment giving the name of owner and stock book reference corresponding with the entry in the warehouse book.

It is for the purpose of seeing that the goods actually on hand correspond with the entries in the ledgers that stock is now being taken, and here we see the men working in gangs of two, specially delegated, taking a record of every article, one calling out a description of the goods, with brand numbers and stock-book reference, and the other writing down; a chalk mark being registered on each lot to indicate that it has been "taken." These records are afterwards tallied by an independent set of clerks with the warehouse books and discrepancies, if any, noted for subsequent investigation, but as already mentioned, the goods on hand are generally found to compare correctly with the records.

TYPICAL SOUTHERN SEASIDE SCENERY.

SOUTHERN RAILWAY.
THIS BIT OF COAST COMMENCES JUST EAST OF LYME REGIS (DORSET) AND EXTENDS PAST THE LANDSLIP (DEVON), SEATON, SIDMOUTH, BUDLEIGH SALTERTON TO EXMOUTH WITH DARTMOOR IN THE BACKGROUND. IT IS TYPICAL OF THE MANY CHARMING HOLIDAY REGIONS TO WHICH THE SOUTHERN RAILWAY PROVIDES ACCESS BY EXPRESS RESTAURANT CAR TRAINS.

Above is a half-tone reproduction of a particularly pleasing poster. The original is a splendid combination of the poster painter's art, and the colour printer's skill.

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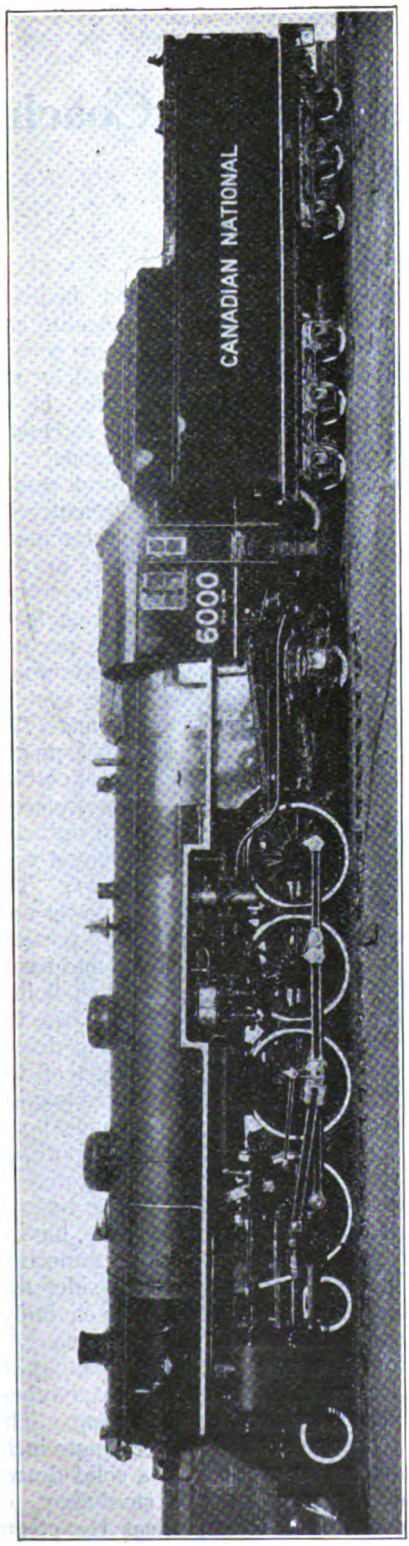

4-8-2 Locomotive, Canadian National Railways.

CLAIMED to be the largest and most powerful passenger locomotives in service on the Canadian railways, the 4-8-2 or "Mountain" type engines of the class represented by No. 6000, the first to be placed in traffic, constitute a great advance on any hitherto employed by the Canadian National Railways. Sixteen of these engines have so far been constructed by the Canadian Locomotive Company, of Kingston, Ont., Nos. 6000–6015. While including many Canadian National Railway standards the design embraces a number of special constructional features and fittings, including mechanical stokers, feed water heaters, rocking grates and power grate shakers, superheater (of the Robinson type), &c. The equalising system covers the engine bogie wheels in one group, and the coupled wheels and the trailing truck in the second. The tender calls for special remark in that it is carried on two six-wheeled bogies, and because of its large water and coal capacity. Six of these engines work on heavy fast passenger services between Montreal and Toronto, the others work in the Atlantic region.

Leading dimensions are as follow :—

Cylinders	26 in. by 30 in.
Coupled wheels	6 ft. 1 in. diam.
Bogie wheels	2 ft. 10¼ in. diam.
Trailing wheels	3 ft. 7 in. diam.
Coupled wheelbase ..	19 ft. 6 in.
Engine wheelbase	41 ft. 9 in.
Total wheelbase	79 ft. 1¾ in.
Steam pressure	210 lb. per sq. in.
Heating surface—	
Tubes and flues	3,731 sq. ft.
Firebox and arch tubes	348 sq. ft.
Superheater	832 sq. ft.
Total	4,911 sq. ft.
Grate area	66·7 sq. ft.
Adhesion weight	101¼ tons.
Engine weight	151¼ tons.
Total weight	257½ tons.
Tender, water capacity ..	10,000 galls.
Tender, coal capacity ..	17 tons.

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"Sentinel-Cammell" Steam Rail Coach for Use in Jersey.

IN the May RAILWAY MAGAZINE, in the course of Mr. H. L. Hopwood's article on "The Railways of Jersey," reference was made to a steam rail coach then under construction for the Jersey Railways and Tramways, Ltd. This has since been delivered and is now illustrated. As will be seen, it includes many features of special interest. The advantages offered by a suitably designed rail motor coach are considerable, but in the past such vehicles have adhered very closely to the practice associated with the construction of locomotives and carriages of the ordinary kinds. The weight factor in a self-contained vehicle such as the rail motor coach may, however, be said to determine very largely the degree of economy with which the car can be operated, and it is desirable that the tare weight should be reduced as much as possible in relation to the number of passengers or merchandise loads carried. In other words, what is required is a vehicle which, owing to its simplicity and lightness of construction, is capable of being satisfactorily propelled by a smaller and less complicated power unit than the ordinary locomotive style of construction, and the motive throughout the design of the car should, so far as is possible, be weight reduction without impairing either the strength or carrying capacity. Moreover, in the light of past experience it is now realised, particularly where colonial and similar railways are concerned, that advantage lies in the ability to separate what may be termed the "driving" from the carriage portion, to permit of replacement and repair without necessarily removing the car as a whole from traffic.

The Jersey car illustrated was produced by the Sentinel Waggon Works (1920), Ltd., in collaboration with Cammell Laird and Co. Ltd. It is designed for service on the 3-ft. 6-in. gauge lines of the Jersey Railways & Tramways Ltd., for providing intermediate passenger traffic facilities between St. Helier and St. Aubin and Corbiére. This is only one of several models which have been prepared by the "Sentinel" firm, whose name is so prominently identified with the successful development of steam road wagons on a very large scale. The boiler and engine are standard with those of the "Sentinel" steam road wagons, which have for many years past been successfully used in this country and many other parts of the world. It is estimated that, with an average loading of 28, and covering 150 miles per day on 300 days, revenue at 1d. per mile would be £5,250 per annum, and the cost of running and ordinary maintenance £778, which leaves a very big margin for depreciation and for paying off the original cost of, say, £2,000. Fuel consumption is placed, on the basis of experience on an ordinary approximately level line, at about 4 cwt. per 120 miles run, or at most 5 cwt. The coach consists of two parts, the power unit or driving portion, and the body portion. The power unit is self-contained and easily detachable. It consists of engine, boiler, water tank, coal bunker, controls, &c., the axle nearest the body being chain driven from the engine. The wheelbase of the power unit is 7 ft. 3 in. The body portion rests on, and is attached to, the engine bogie by means of a pivot, giving the two portions the necessary flexibility for the negotiation of curves. The other end of the body is supported on a four-wheeled bogie, having a wheelbase of 5 ft. A flexible connection closes in the space between the sides and top of the engine cab, and coach body. The vertical boiler is of the design used on "Sentinel" steam road wagons. It is cylindrical, with short straight water-tubes, and is centrally fired from the top. The working pressure is 230 lb. per square inch. The superheater consists of a solid drawn steel coil placed in the smokebox, of sufficient surface to superheat the steam

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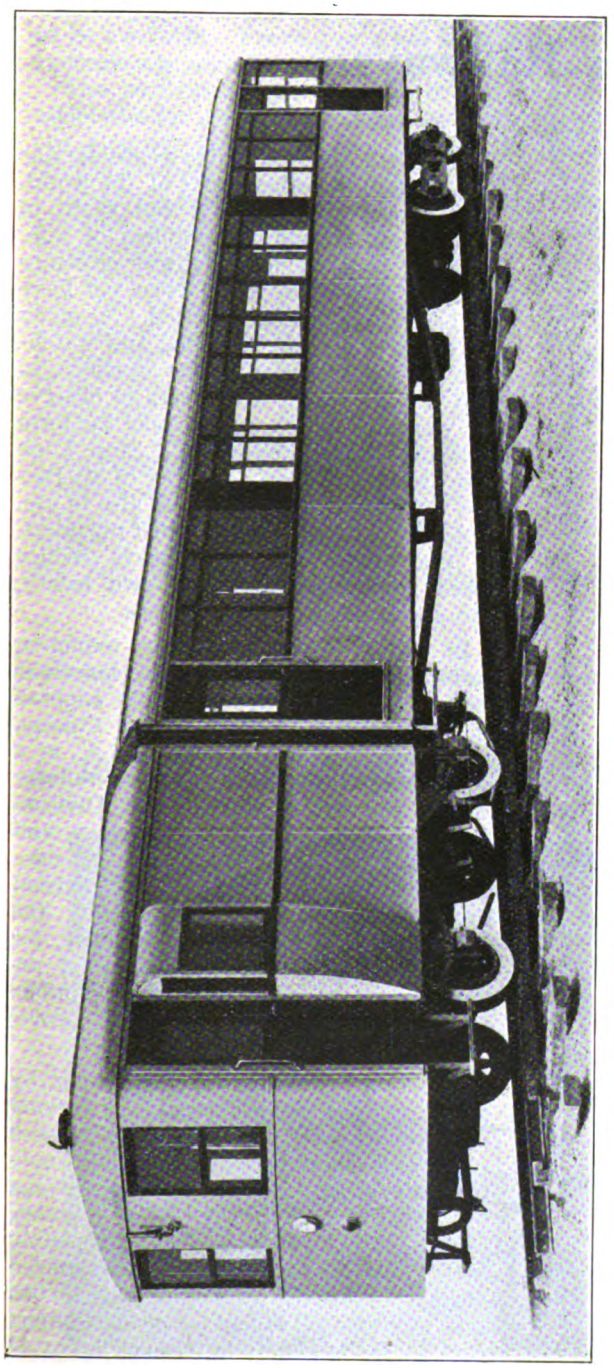

GENERAL VIEW OF "SENTINEL" STEAM RAIL COACH, SHOWING DRIVING UNIT.

100° Fahr. A feed-water heater is also fitted, utilising the exhaust steam from the engine. The engine is of "Sentinel" type. It has two double-acting high-pressure cylinders, each $6\frac{3}{4}$ in. diam., 9 in. stroke. Its working parts are self-oiling and entirely protected from dust and grit. The cylinders are lubricated by a mechanical oil pump. The valves are specially designed for superheated steam.

The power unit bogie consists of an underframe on which is fixed the engine and boiler, water tank, fuel bunker, &c. The whole is covered in by a steel superstructure built up of steel sections and steel plates, with projecting look-outs and hinged doors of timber with steel panels on each side. The fuel bunker is fed through a hinged cover on the side of the cab. The coach body consists of a light steel framing with outer steel panels, and timber window frames with plate glass. Hinged doors of timber with steel panels are fitted at each end and on both sides of the coach. A similar door in the end of the coach next to the engine cab provides communication between the two. The body is built in one with the underframe, the body sides assisting the underframe in withstanding stresses. The underframe is composed of light but strong members, comprising two flanged and flat centre sills, with crossbars carrying the floor and the coach sides.

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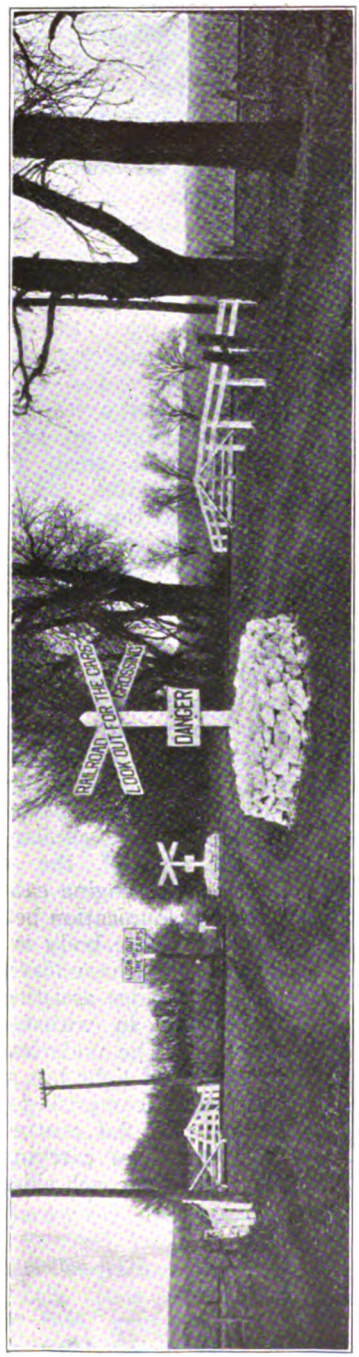
Railway Crossing Protection on United States Railways.



GENERAL VIEW OF HIGHWAY GRADE CROSSING, CHICAGO & NORTH WESTERN RAILWAY.

IN North America, and to a considerable extent in other parts of the world, though the need is but slight in Great Britain, the problem of safeguarding road traffic at railway crossings involves difficulties which even yet have not been altogether surmounted. At many places gates are not provided and watchmen are not stationed at the crossings, so that it rests with road drivers to observe the warnings, which usually take the form of boards bearing the words, " Stop, Look and Listen," though a number of alternative warning arrangements are also in use. Motorists appear to be the chief offenders, in that they will not always reduce speed sufficiently for their own safety, and are inclined to take chances.

In order to enforce speed reduction under such circumstances an ingenious method has been experimentally adopted on the Eastern Division of the Chicago and North Western Railway, U.S.A., as a result of co-operation between railway officers and Mr. W. D. Kimmell, Division Engineer, Nebraska State Highways, and the County Road Commissioners. We are indebted to Mr. Womeldorf, Division Engineer, Norfolk, Nebraska, of the Chicago and North Western Railway, for the photograph and particulars of arrangements adopted to protect a public highway crossing at Meadow Grove, Nebraska.

The root principle is that, either by means of artificial obstacles or by curving the public road, automobiles are forced to slow down and thus observe the warning indications and be prepared for the passage of a train on the railway. A preliminary warning is given by a board lettered plainly with the word " Slow," while the artificial obstacles are in the form of mounds, on one side or other of which the vehicles must pass, all being plainly lettered as indicated and painted white, including the stones of which the mound is composed, so that even at night it is virtually impossible for them to be overlooked. It is pointed out that the " rip rap " used in this instance

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was employed only because it happened to be available. Fencing or a low wall of concrete can equally well be employed.

The particular type of "retard" was adopted after considerable discussion with the County Commissioners, because it seemed to meet with less opposition than other types, especially "humps," which all objected to on account of the danger of damaging automobiles whose drivers might not know of their presence and who might not see or who might disregard the advance warning signs. The mounds are located 100 ft. each way from the centre of the track and 50 ft. beyond the limits of the right-of-way. Being squarely in the centre of the highway, they are in the most conspicuous position possible. Because of this position it is impossible for drivers not to see them. Automobile drivers are, therefore, first made aware of the fact that they are approaching a railroad crossing and must next put forth a physical effort to retard fast moving cars and steer them around the mounds. If then they find there is a train approaching they still have nearly 100 ft. in which to stop. This stopping distance is sufficient for speeds of 30 to 35 m.p.h.

Comment on this particular type of crossing protection has thus far been very favourable. It is, perhaps, not in its final form, but it does retard the speed of traffic; it is in a conspicuous place; it is not expensive, either in first cost or in maintenance, and it is in order all of the time. The alternative of providing a curved approach by diversion of a road which would otherwise be straight has also much to commend it. The artificial mounds and the preliminary and principal warning boards are necessarily located as found most desirable according to individual circumstances.

A 10-CAR "SOUTHERN BELLE" NEAR EARLSWOOD.

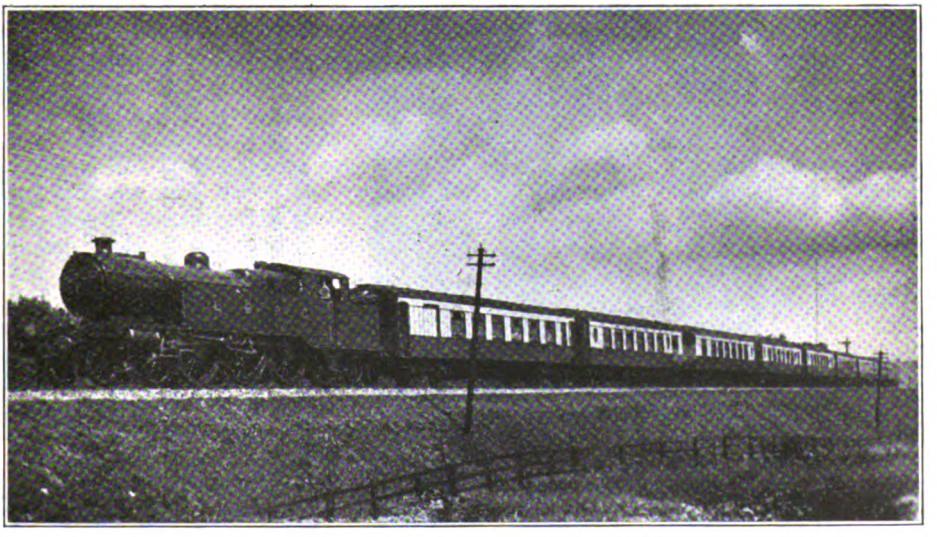

Photo.] L.B. & S.C. SECTION 4-6-4 TANK LOCOMOTIVE, No. 328. [*O. J. Morris.*

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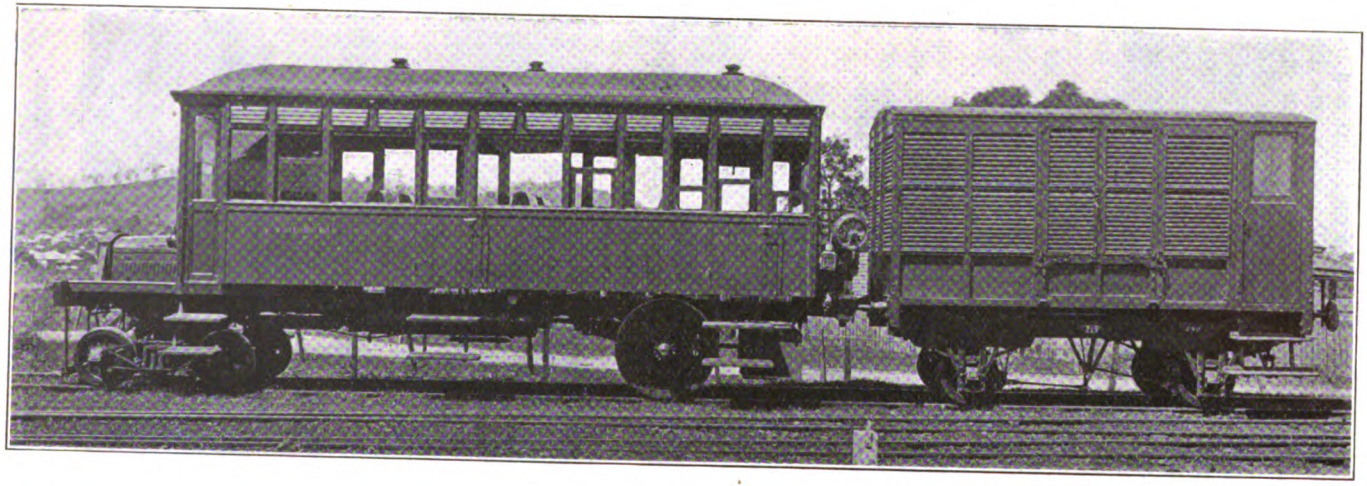
LOCOMOTIVE RAIL MOTOR, NEW SOUTH WALES GOVERNMENT RAILWAYS.



WE are enabled, by the courtesy of Mr. E. E. Lucy, Chief Mechanical Engineer, New South Wales Railways, to illustrate a locomotive rail motor which has been in successful operation on the Lismore-Casino-Grafton line for over two years. This line is on the north coast, and is isolated from the rest of the New South Wales Railways.

The Commissioners had a 50-h.p. four-cylinder motor lorry, which had been running on the streets of Sydney, converted into a motor train by fitting it with windows, roof and seats, and also six flanged wheels, so as to run on the railway track. A trailer is also provided for the carriage of cream cans and parcels, dairying being the principal industry of the district. The car has seating accommodation for 33 passengers and weighs 7 tons 16 cwt. 2 qr.

The gross earnings per train-mile during the twelve months ended November, 1921, were 50·31d., and the working expenses 14·85d., but the latter figure does not include its share of the maintenance of the railway track, which is also used for steam passenger and goods trains. The Railway Commissioners are having a larger rail motor constructed at the railway workshops at Eveleigh for use on the Tamworth-Barraba branch line and if this proves satisfactory rail motor services will be inaugurated on other branch country lines.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition* (1923) *of this standard railway reference work is on sale at* 5*s. net, or by post from the* RAILWAY MAGAZINE *Offices,* 33, *Tothill Street, Westminster, London, S.W.*1, 5*s.* 6*d., Overseas,* 5*s.* 8*d.*

Northern Counties Committee (Ireland).

The signalbox at Ballyboyland* has no connection whatever with the level crossing; the gates at that place are locked and unlocked by a lever at the crossing which also operates the two (down and up) gate protection signals. The whole arrangements are of the type standard on this line. The signalbox in question was erected in connection with a crossing loop for trains to shorten the section between Dunloy and Ballymoney (7¾ miles). The rails of this crossing loop were lifted during the war and have not been replaced. Tyers' electric train tablet instruments are used on this line. Five new engines, two 4-4-0 and three 0-6-0, with coupled wheels of 6 ft. and 5 ft. 2½ in. diam., respectively, have been placed in service this year. These engines are all fitted with 19 × 24 in. cylinders and superheaters, and were built at the Derby Works. Additional rolling-stock, both engines and carriages, are on order but are not available for this season's traffic. The Belfast and Portrush Golf Express is timed to do the journey in 95 minutes, and this timing gives plenty of margin for the more difficult running over the portion of single line between Ballymena and Portrush.

[Reply to DENIS O'C. TAGGART.]

Great Western 4-2-2 Locomotives.

The last of these engines was scrapped some years ago. The most remarkable run on record of one of these engines was that made by No. 3065, *Duke of Connaught*, on May 9, 1904, when the 118½ miles from Bristol to Paddington via Bath, were covered at an average speed of 81·3 m.p.h. This run was fully described in issues of the RAILWAY MAGAZINE at that time. Your reference to the "Cornish Riviera" express passing Slough 10 minutes late suggests that there had been some traffic delay. That the same engine passed on another occasion at exactly 4.17 p.m., having covered the 155¼ miles from Exeter to Slough in 152 minutes, suggests that the locomotive was not in fault on the earlier run.

[Reply to "COEUR DE LION."]

Ramps.

This term is used in three connections in railway working. Ramps are devices used for re-railing wagons, &c., which have become derailed, and consist of metal and are designed to provide a pathway along which a wheel can be drawn and raised to pass over the top of the rail and so get back into correct position. The same term is used to indicate the

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sloping end of a platform, while in connection with automatic train control, and similar devices, "ramps" of lengths ranging from 20 to 60 or 80 ft. are sometimes fitted between or alongside the running rails so as to provide a surface by which mechanical or electrical contact is made between the track and the engine apparatus.

[Reply to E. COPE.]

Converging Junctions.

Safety points at converging junctions are installed mainly to provide against a train over-running a signal for a short distance, and even should derailment or collision with vehicles, etc., placed in an over-run siding result, it is not expected that serious damage would result. Should a train run by a signal at speed at such a location, the damage resulting from derailment or from collision with vehicles in the siding would probably be less than that from collision with another train on the running lines. The rules governing safety points and the use of sidings as an alternative to derailing spurs are specified by Board of Trade regulations.

[Reply to W.S.U.]

Railway Timetable Maps.

These are not to be trusted in regard to ownership of particular sections of line, as they usually include routes over which their own trains are run, though the line may belong to another company, and frequently sections where through services or associated facilities apply. Please see the ownership maps of individual systems, in the 1922 RAILWAY YEAR BOOK as before grouping, and in the 1923 edition for the grouped systems. In regard to the section you mention, both London and North Western and Great Northern trains are concerned in services on various portions.

[Reply to W. H. D.]

Victoria Station, South Eastern and Chatham Railway.

The Great Western Railway Company had an interest in the Victoria Station and Pimlico Railway, though that company is now incorporated in the Southern system, hence it ranks as part owner of Victoria Station. At various periods several Great Western local services have been worked to and from Victoria via Addison Road, as well as through expresses. The West London Railway was fully described by the Rev. W. J. Scott in the April and May, 1920, numbers of the RAILWAY MAGAZINE.

[Reply to G. TIPPETT.]

Piloting.

When a pilot engine is attached in front of the locomotive ordinarily booked to take a train, the pilot driver takes control, though the train engine driver still has the responsibility of seeing that signals are correctly observed and that speed orders, &c., are obeyed. On some lines, as far as it is convenient, the assisting engine is placed behind, so that the driver whose duty it is to work the train retains full responsibility, but this is not always practicable.

[Reply to "MIDLAND."]

Great Western Railway Birmingham-Bristol Expresses.

Working times over the Midland line between Standish Junction and Yate show that there is no distinction made in the fastest end-to-end times of the two companies' trains, although there are intermediate variations in one or two minor instances. Your sweeping conclusions have no foundation in fact. We have no information on your other hypothetical point.

[Reply to "GREATER WESTERN."]

Cuffley-Hertford Line.

Opening for passenger traffic may be announced at any time. General construction was completed before the war, but only a single track was laid. Doubling and the stations are now, we understand, virtually finished. It is doubtful whether this line will be used by through expresses. It has been constructed mainly as a relief to the main line for goods traffic and to open up the district traversed.

[Reply to Rev. R. H. SIMPSON.]

Main Line Crossings.

Mr. H. L. Hopwood directs attention to the crossing at Newark—Great Northern over Midland—which he considers should be mentioned in addition to that at Retford—Great Northern and Great Central lines—as it is remarkable that the Great Northern main line should have two level crossings within 18 miles of each other.

[Further reply to A. RANSOM COWLISHAW.]

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London & North Western Engines Working on Tilbury Line.

Recently a number of excursion trains from the old L. and N.W. system have been worked to Southend-on-Sea and for convenience the engines have been running to Tilbury shed. The trains in question are worked by engines of the "Experiment" class and on certain occasions by goods locomotives. No engines of the "Prince of Wales" class have worked to Tilbury.

[Reply to "NAUTICUS."]

Late General Managers.

Last General Manager of the Great Northern Railway was Mr. C. H. Dent, and the last one of the Midland Railway Mr. Frank Tatlow. Information of this character may be obtained from the RAILWAY YEAR BOOK, 1922, which set forth the railways as officered before the grouping became operative on January 1, 1923.

[Reply to P. S. EVETTS.]

Chipstead Valley Railway.

This line was fully described in the July, 1901, number of the RAILWAY MAGAZINE. This issue is long since out of print, but you may be able to see a copy in a public library. The line is certainly notable for its numerous curves and severe gradients, due to the character of the country traversed.

[Reply to "CHIPSTEAD."]

Ruling Gradient.

This term indicates the maximum gradient allowed on a particular section of line unless as a specially authorised exception. Average gradient indicates the average over a given length, usually the average of substantially continuous grades whose incidental variations are frequent.

[Reply to J. C. PALMER.]

London and North Eastern Railway (Great Eastern Section) Rolling-Stock.

Ordinary corridor bogie vehicles on this section average in weight, about 26–27 tons each. As to restaurant cars, 12-wheeled kitchen cars weigh 33½ tons, 8-wheeled kitchen cars 29–30 tons, and the ordinary open cars average 27 tons each.

[Reply to E. J. PEARCE.]

Paddington Station.

For information as to numbers of platforms and other particulars in regard to principal railway stations we would refer you to the RAILWAY YEAR BOOK. At Paddington there are now 12 platforms, with which may be associated two platforms at Bishop's Road station.

[Reply to M. L. BARKWAY.]

Midland Traffic Working.

Space will not permit of a detailed reply to your query. We would refer you, however, to the publication entitled "Midland Traffic Working," in which the Midland train control system is fully described, and of which copies can be had from this office, price 5s. net.

[Reply to "INTERESTED."]

Top-Feed.

Expression "top-feed" denotes that a locomotive boiler is fed with water from the top instead of at the two sides on the centre line, and the pipe you have noted running round the boiler is used to convey the water from the injectors to the top-feed apparatus. [Reply to I. C. A.]

Through Carriages.

Presumably the Euston-Birkenhead carriage noted by you in Lime Street station, Liverpool, had been used for other than its proper duty and the name board allowed to remain. No London Midland and Scottish locomotives have yet appeared in the new livery, though a number bear the letters L.M.S.

London Midland and Scottish (Midland) Settle and Carlisle Section.

This section has been frequently dealt with in Mr. Cecil J. Allen's monthly articles. The last occasions on which detailed reference was made were August and September, 1913, August, 1918, and June, 1921. [Reply to T. D. S.]

Metropolitan Railway Steam Locomotives.

Several of the Metropolitan 2-4-0 and 0-4-4 steam locomotives have been purchased, for sale, by Mr. C. Williams, of Manoravon Works, Morriston, Swansea. When observed by you at Swindon they were on their way to South Wales.

[Reply to B. TRAPNELL.]

Leamington Spur Line.

No trains use regularly the spur line connecting the London Midland and

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Scottish and Great Western lines at Leamington. We have no information as to future intentions, nor in reply to your other query.

[Reply to J. F. READE.]

London and North Western 4-6-0 Locomotives.

It is usual to refer to the "Claughton" and "Prince of Wales" classes as having 6 ft. 6 in. and 6 ft. coupled wheels respectively, but with new tyres the correct dimensions are 6 ft. 9 in. and 6 ft. 3 in.

[Reply to E. COPE.]

Railway Sundries.

Try the "Miscellaneous" columns in this periodical. Mr. O. J. Morris, who advertises Brighton railway photographs, writes:—"The results from these small advertisements are wonderful."

[Reply to "BOOKWORM."]

Locomotive Depots, Southern Railway.

Particulars of principal engine sheds are given in the 1923 edition of the RAILWAY YEAR BOOK. Most of these have engines of all classes which work on the routes with which they are associated.

[Reply to D. R. ROBSON.]

Bristol Distances, Great Western Railway.

From Temple Meads station to Ashley Hill and Coalpit Heath the respective distances are 2 miles 44 chains and 9 miles 13 chains.

[Reply to "COUNTY TANK."]

Foster, Rastrick & Co.

As far as we are aware this firm is not now in existence. If it has a lineal successor it is not concerned with locomotive engineering.

[Reply to G. W. BISHOP.]

Railways in Holland.

The Dutch State and Dutch (H.S.M.) Railway Company's system are now operated by a Committee of Management representing both systems.

[Reply to REGINALD H. COE.]

South Eastern and Chatham Locomotives.

The standard express passenger engines on this line are all 4-4-0, the only other locomotives of special note in use being the 2-6-0 mixed-traffic class.

[Reply to "Loco."]

Kilometre Posts on French Railways.

These are usually located on the left-hand side of lines radiating from Paris, except in the case of the Paris-Orleans Railway, where they are on the right.

[Reply to H. C. WALLACE.]

"The Torbay Limited."

This train is the 12 noon from Paddington for the Torquay line, for which rolling-stock painted in the new colours has been adopted.

[Reply to "MOGUL."]

Distant Signals.

Mr. S. H. Eaton points out that yellow or orange is also used for distant signals at night on sections of the Great Western Railway.

[Further reply to R. WEBSTER.]

Midland (Northern Counties) Railway Locomotives.

We have no information as to any change in the colouring (dark green) employed for locomotives on this line.

[Reply to "MIDLANDIAN."]

"999" Class Locomotives, Midland Railway.

There are ten engines of this class, principally used on the Northern section of the Midland main line.

[Reply to DOUGLAS HARVEY.]

"Abbey" Class Locomotives.

We are aware that Great Western engine No. 4069, formerly *Margam Abbey*, now bears the name *Westminster Abbey*.

[Reply to J. L. T. and others.]

Woodside to Oxted.

January 1, 1917, is the date the closing of the line from Woodside to Oxted, via Coombe Lane, took effect.

[Reply to P. S. EVETTS.]

The Broad Gauge.

This was 7 ft., or we believe, to be exact, 7 ft. 0¼in.

[Reply to B. Y. WILLIAMS.]

London Midland and Scottish (Midland) Engine No. 2290.

Colour of this 0-10-0 engine is black.

[Reply to T. D. S.]

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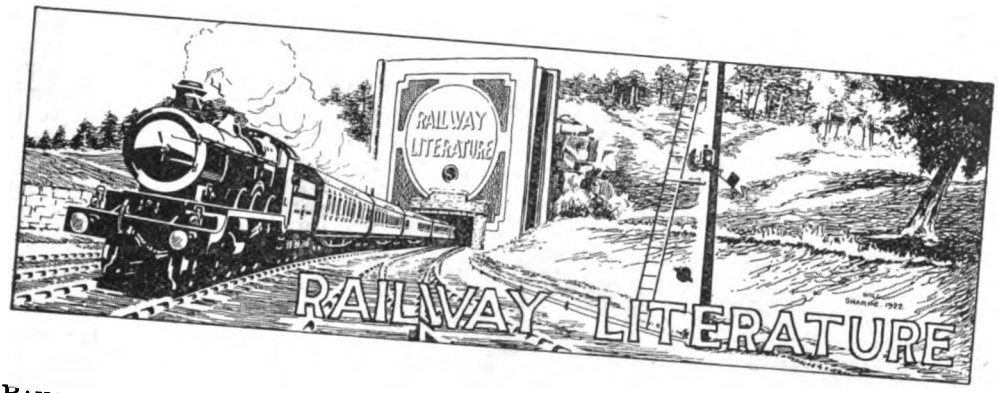

RAILWAYS FOR ALL. By J. F. Gairns, M.I.Loco.E. [London: Ward Lock & Co. Ltd. Cloth. 6 in. × 8½ in. × 2⅛ in. 384 pages. 100 illustrations. Price 6s. net.]

It may be true that there is no royal road to learning, but certain it is that some of the paths to knowledge are easier to traverse than are others. One is moved to this reflection by a careful perusal of Mr. Gairns' new book. Packed with information concerning every phase of railway operation and railway life, *Railways for All* is an attractive work illustrated in such a fashion that curiosity is excited, and written in a manner calculated to satisfy the most exacting appetite for the history and the technicalities of the iron road, its means of locomotion, its traffic and its control.

Acting in accordance with the theory that it is by the study of the past one is able to understand the present, the author begins by asking "What is a Railway?" and then proceeds to answer his own question, first by an entertaining account of the timber and stone-ways of other days, gravity and cable railways, suspended and rack railways, and other oddities of rail transport, until he arrives at a definition of what a railway really is.

Under the heading "Early Days," the initial history of the industry is told and this is not confined to England, the motherland of rail transport, but facts are furnished relating to the first railways on the European Continent and in North America to say nothing of such spheres of action as China and Northern Africa.

In his chapters referring to locomotive building and working, the author is particularly happy, and as ungrudgingly informative as he is clear and understandable. For those who possess that dangerous attribute "a little learning," but desire to become masters of the subject, Mr. Gairns is an admirable cicerone. Here again the author does not confine himself to British practice but systematically engirdles the globe to ensure the varying types of locomotives in lands overseas being illustrated, or described, or both. Famous Continental expresses are portrayed in paragraphs of commendable succinctness and a chapter devoted to the "Knights of the Footplate" records the training and work involved in the romantic occupation of an engine-driver.

Railway workshops, railway carriages and wagons, and royal trains are discussed, while railway signalling, the working of trains, the arranging of a time-table and the meaning of head codes and engine whistles, all receive attention.

Electrification of railways, of course, has its share of notice, and much that is a mystery to the unsophisticated traveller is made clear and intelligible.

The foregoing are but samples of the scope of the book, and by no means exhaust the tale of its resources. With amiable ease Mr. Gairns discourses on tube and other underground systems, discusses the business side of railways, tells of permanent-way matters such as sleepers, rails, fishplates, points and crossings, check rails, conductor rails, and so forth. Tunnels, bridges, large stations, special working, railway service at home and abroad, rail motor cars and trains, and British railway special war work are but a few more of his subjects.

Lack of space prevents further details as to the contents of the book. Suffice it to say the work is a monument of the industry of the author, who appears first of all to have listed every conceivable feature in railwaydom and then, with the lively sympathy of a born railwayist, set out to describe each one.

The railway student will find the book of great use as an easy medium for reference, while employees in the railway service, particularly those of the junior ranks who desire to know something more of the great industry in which they are engaged than they are likely to acquire within the limits

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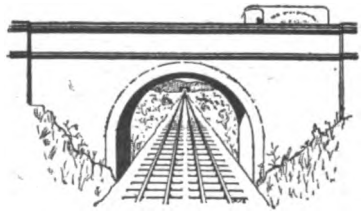
of their own surroundings, will secure in *Railways for All* an educational mine of immense value. Those many members of the travelling public who take an interest in the history, development, and practical everyday working of the world's railway systems will appreciate the book by reason of the enormous amount of information it conveys, as authoritative and convincing as it is entertainingly presented.—W. P.

"THE 10.30 LIMITED." By W. G. Chapman. [Published by the Great Western Railway. Paddington. Price 1s.]

This booklet, described as "A railway book for boys of all ages," is designed to explain the outstanding features of railway equipment and operation on the basis of a journey by the Paddington-Plymouth non-stop express, on which the reader in imagination accompanies the author. One hundred and twenty illustrations, including a frontispiece in colour and a number of explanatory sketches add interest to the 119 pages provided. Statistics indicating the volume of traffic are included here and there, but, in the main, the booklet is descriptive, dealing with various points which arise in the course of the journey. Thus, the first chapter is concerned with the starting point, Paddington station; the second with various features of interest noted on the journey as far as Reading; the third with essential facts concerning locomotive design and operation; while the fourth deals with fuel and the means whereby water is collected while travelling. Carriages, train lighting and heating, the vacuum brake, slip coach working, permanent way, gradients, exchanging the mails, bridges, signals and signalling, safety appliances (including the Great Western cab signalling system), the control of train working on single lines, train speeds, and a few notes in regard to freight traffic, provide subject matter for other chapters, while the volume concludes with a short description of the Great Western system as now constituted as a result of grouping, and a few final notes on "Glorious Devon." Admittedly designed to attract public attention directly to the "Cornish Riviera" express, and indirectly to the quality and completeness of Great Western facilities in regard both to passenger and freight traffic, this booklet will, no doubt, be perused with great interest by a wide circle of readers, and we may congratulate the Great Western Railway Company upon its issue.

LOCOMOTIVE CATECHISM. By Robert Grimshaw. [The Norman W. Henley Publishing Company, 2, West 45th Street, New York, U.S.A. Price $4.]

The present edition of this well-known book, the thirtieth, is so extensively revised and enlarged that it may almost be described as a new work. Upwards of 4,000 questions are set and answered, a large proportion being those used officially by prominent American railways in examining firemen and engineers for employment and promotion. The replies are illustrated with nearly 500 drawings and diagrams, almost every feature of locomotive design and practice being covered, including matters of historic, ordinary and modern practice. The new edition is described as "A practical and complete work on the design, construction, running and repair of all kinds of locomotives," including "up-to-date information on the air brake, superheaters, valve gears and compound, electric and uniflow locomotives, prepared for firemen, engineers, trainmen, switchmen, shop hands and roundhouse men." The volume is well arranged, with a very complete index, and although its subject matter is necessarily confined exclusively to American locomotive practice, there is a great deal of information useful to British locomotive engineers and traffic men, as well as to those employed on railways in countries where practice is more or less analagous to that in the United States.



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CABOOSE FOR GOODS TRAINS, GREAT INDIAN PENINSULA RAILWAY.

WITH A VIEW TO THE RUNNING OF BRAKE-FITTED GOODS TRAINS ON ALL SERVICES A NUMBER OF THESE CABOOSE VANS HAVE BEEN BUILT FOR USE INSTEAD OF THE USUAL WEIGHTED 20-TON VANS.

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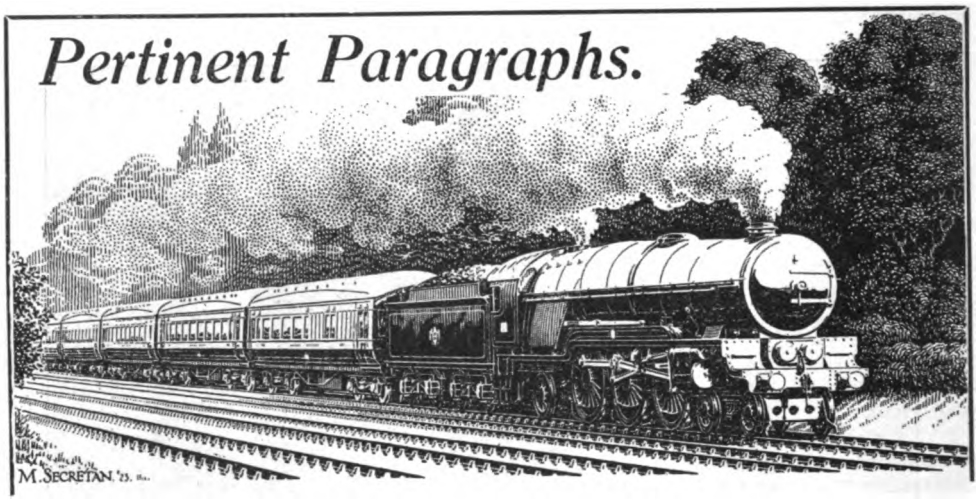
Pertinent Paragraphs.



First Statistics of the Grouped Railways.

FOR several months the Ministry of Transport did not publish any railway statistics, the excuse for the long delay being that it was desirable to show the figures of each group compared with the aggregate figures for January, 1922, of the companies now included in such groups.

The statistics at last available relate to January, 1923, the first possible for the new companies. Unfortunately, the passenger receipts are by no means satisfactory. The companies reduced their fares and gave more liberal train services, but as a result of these concessions the revenue suffered by as much as 9·35 per cent., although the passengers carried showed an increase of 3·65 per cent.

According to these statistics, the total number of passengers (excluding season ticket holders) carried by all railways in Great Britain in January, 1923, was 99,205,978, an increase of 3,495,284 over January, 1922. As a result of the reduction in fares and an increase in the proportion of passengers conveyed at less than standard fares, the receipts showed a decrease of £445,260. The passenger train-miles run were 1,484,115 more than in January, 1922, an increase of 7·86 per cent.

Although the trade of the country was not so good as anticipated, the total tonnage of freight traffic conveyed (excluding free-hauled) showed an increase of 6,682,800 tons over January, 1922. The average length of haul for all freight traffic (except free-hauled) fell from 56·63 miles to 52·52 miles. While, therefore, the increase in tonnage was 29·67 per cent., the increase in the corresponding ton-miles was only 20·25 per cent. Freight train receipts (less cost of collection and delivery) in January, 1923, amounted to £9,828,069, an increase of £457,777, or 4·89 per cent., over January, 1922. The freight train-miles run were 16·20 per cent. more than in January, 1922. The average train load increased from 127¼ tons to 134 tons.

It is of interest to observe an innovation in the statistics, which include for the first time particulars of the tonnage dealt with, and the cost of working, at 115 selected goods depôts.

Will there be another Race to Scotland ?

IN the years prior to grouping, in connection with August tourist traffic to Scotland, the publicity departments of the West Coast and East Coast routes, and in a more subdued manner that of the Midland also, usually indulged in announcements emphasising the advantages of their respective routes.

It was foreseen that the effect of the grouping would be to intensify the competition between rival routes for certain traffic, particularly that to Scotland, and if one may judge by the announcements put out by the London Midland and Scottish Railway and the London and North Eastern Railway, both companies this year are making a bigger bid than ever for the patronage of visitors to Scotland and back.

The East Coast boldly advertises " this is the quickest route," and " Come to Scotland by the ' Flying Scotsman,' " whilst the West Coast replies by inviting us to " travel to Scotland the ' Best Way,' " and by insisting that, because of the scenery *en route*, " there is never a dull, tiresome moment for passengers travelling by the L.M.S. routes to Scotland."

Now that each route is under one management for its entire distance, the rivals may not be averse to making a bid for speed

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supremacy. In some quarters the London and North Eastern Railway is supposed to be anxious to have an opportunity for its new 4–6–2 express locomotives to show their paces and for the 4–4–2 booster-fitted engine to display its power.

Terminus as Official Name for a Station.

THE original terminal station at Southampton, long known as Southampton Docks and more recently as Southampton Town, but still generally called Southampton Docks, is now officially known as Southampton Terminus. This is the only station, so far as we can call to mind, so designated. Southampton has increased in size so much in recent years that the West station (originally called Blechynden) is, except for traffic connected with the docks, more the "Town" station than the original terminus; hence the necessity for a change of title. It is a question whether Southampton Central, East, or Canute Road (on which the terminus abuts) would not have been a happier and more distinctive choice. Amongst changes in the names of stations consequent upon the grouping, the original New Cross station of the Croydon Railway (now London, Brighton and South Coast section) is re-named New Cross Gate, the later New Cross (North Kent, South Eastern and Chatham section) remains New Cross. The South Eastern and Chatham section station at Tunbridge Wells becomes Tunbridge Wells (Central), and Ashford Junction—Ashford Kent, to distinguish it from the Ashford (Middlesex) station on the London and South Western section. At Dorking, where the South Eastern and Chatham station of Boxhill is contiguous to the London, Brighton and South Coast section Dorking station is to be renamed Deepdene. The London, Brighton and South Coast section Boxhill station is about a mile north of Dorking station on that section. It is interesting to record that for the recent races, excursions were advertised from South Eastern and Chatham section stations to "Ascot West," but only one station (Ascot and Sunningdale) is shown on railway maps and the London and South Western section time-tables. These trains ran via Wokingham.

Will the Great Northern and City Railway become Joint Metropolitan and L. & N. E.R.?

WITH reference to "Pertinent Paragraphs" in the August issue on the subject, it should be emphasised that tube extension beyond Finsbury Park is a complicated problem, which has been intensified by railway grouping. In 1914 the Great Northern and Metropolitan Railways had agreed for the Great Northern and City, already acquired by the Metropolitan Railway, to be jointly owned by the two companies and for a junction between the two lines to enable trains from and to the suburban sections of the late Great Northern Railway to run over the Great Northern and City Railway. The then North London Railway asked that it should be granted perpetual running powers over the suburban lines north of Finsbury Park of the Great Northern Railway and that the Great Northern Railway should electrify the connecting railway between Finsbury Park and the North London Railway at Canonbury—an arrangement that would place the North London Railway on an equality with the Great Northern and City Railway for Great Northern suburban traffic. As the North London Railway only works over the Great Northern Railway under an agreement determinable by five years' notice, the latter company would not agree to the demands of the North London Railway, and the Bill was withdrawn.

What the Metropolitan Railway and the late Great Northern Railway would have proposed to Parliament in 1915 has not been disclosed—the war stopped all ideas of railway expansion As an alternative to other through services to and from the North London line, the Metropolitan and London & North Eastern Railways might perhaps inaugurate a scheme to give the northern suburbs electric trains to and from the City by electrification of the High Barnet, New Barnet and Enfield lines, north of Finsbury Park, and the construction near Finsbury Park of a junction for through working of electric services over the Great Northern and City tube, thus carrying out the original scheme which caused the Great Northern and City line to be built so as to be able to take standard rolling-stock, should the need arise.

Dense Traffic at a South Devon Railway Centre.

GREAT alterations are to be carried out at Newton Abbot station, on the Great Western Railway main line to Plymouth and Cornwall. Parts of the present station are as originally constructed for the South Devon Railway from Brunel's plans. The Kingswear (Torquay) branch diverges about half a mile west of the station, but the actual point of junction is at the station, there being four sets of metals between the station and the point of divergence. Relief lines for non-stopping trains are already provided at Newton Abbot on the down side south of the platforms. The platforms are somewhat short, the longest being 669 ft. in length. Two up and one through trains can be accommodated at the same time at the

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platforms, whilst another through platform road on the down side is used for branch trains west to Kingswear, and east to Moretonhampstead.

In the height of the summer 147 passenger and 60 goods trains have passed through or stopped at the station in 24 hours. There is an extensive modern freight-marshalling yard at Hackney, about a mile east of the station. The Moretonhampstead branch train service is inconsiderable, but to and from Torquay a frequent but very easily-timed service is provided. Several of the trains are continued beyond Torquay to Kingswear (for the Dartmouth steamer) and balancing trains start from the same place. Mostly the Kingswear trains, up and down, connect with through trains at Newton Abbot and several have through coaches to and from Bristol, London, &c. There is frequent (almost continuous at certain times) road motor competition between Torquay and Teignmouth; the motors avoid the Shaldon bridge, making the *detour* through Newton Abbot, so following the same route as the trains. A quite frequent competitive service of rail motors between Paignton and Teignmouth, with, say, alternate ones extended to and from Dawlish Warren, ought to attract much traffic in the season. A feature of the Paignton-Newton Abbot service is the frequency of the trains on Sundays—20 up, 19 down—the weekday totals being 26 in each direction. Twenty-five years ago the Sunday service was about five each way.

Enlarging Newton Abbot Station and Yard.

THE new Newton Abbot station should be exceptionally commodious and fitted with conveniences and luxuries of every character. A quarter of a million of money is to be expended. The new station will provide :—

Additional platform accommodation.

Improved booking and parcels offices and cloak room.

Waiting and refreshment rooms on each platform.

Commodious footbridge for passengers, with separate bridge and electric lifts for luggage and parcels.

Improvement of permanent way and provision of additional sidings.

Independent platform for Moretonhampstead branch trains.

New 65-ft. turntable in the locomotive depôt, for turning the largest engines in use on the system.

Electricity for lighting will be installed throughout the station.

The main station buildings, including a commodious dining room and a large booking hall, will be situated on the up side of the line as now.

At the new up "island" platform a "scissors" crossing will be provided. This will enable two trains to be dealt with at the same time.

How greatly the costs of railway engineering works have increased can be judged from the circumstance that the South Devon Railway purchased the necessary land, built a single line from Exeter to Laira—a distance of over 50 miles—including the construction of several tunnels, sea walls and viaducts, and erected the various stations on the 50 miles of railway, including Newton Abbot, all for about £1,250,000, or only five times what is now to be expended upon improvements at one of the stations.

Ticket Conditions and Legal Decisions.

LEGAL decisions in all our Courts right up to the House of Lords tend to suggest that Parliamentary draughtsmen must be the most incompetent men of all classes who hold themselves out to be experts.

Decisions directly opposite to the apparent meaning of Acts are frequently being given in law cases affecting railways. A recent instance is the apparent impossibility of a person travelling with a workman's ticket to limit the amount of compensation to which his dependents may be entitled, if he meet with a fatal accident whilst using the ticket. The Act 62 and 63 Vict. cap 168, section 32, subsection 7, provides as follows :—"The liability of the company under any claim to compensation for injury or otherwise in respect of any passenger travelling by any train run or provided under this section or any passenger returning at a fare fixed under and for the purposes of this section shall be limited to a sum not exceeding one hundred pounds." Although the subsection quoted states clearly "in respect of any passenger," our Courts, subject to appeal, have decided that the widow of a passenger killed is not restricted to £100 for compensation.

Perhaps an even more eye-opening case was that decided against the late London and North Western Railway. It was usual for railways to state in their notices that, although punctuality was not guaranteed, the railway "would pay every attention to ensure punctuality." The Court decided that this was a condition on which the passenger accepted the tickets, and since the railway did not "pay every attention to ensure punctuality," the Court awarded the passenger damages in a case of unpunctuality. The wording of the notice was, consequently, altered to the effect that the time-tables only fixed the time before which the train

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would not start. In times of little traffic, with easily-timed trains that make waits of some minutes at small stations, there is the possibility that the train may, after all, start before time.

The notice that the railway reserves the right to cease issuing tickets two minutes before the time fixed for the departure of the train may protect the company, but clear evidence would be necessary that the company intended to and did exercise this right upon occasions when a train left before time.

Mineral Traffic the Incentive to Railway Development.

THE initial development of our railway system in many districts has been due to the desire to exploit the mineral wealth of such districts. Had not the coal and iron ore magnates of the North of England required rapid and inexpensive bulk transport of minerals, it is a question whether railways would have developed so rapidly for passenger transport.

Many of the districts in which minerals are found possess natural features that necessitate extensive and expensive engineering works on the railways constructed to serve them. But the railways have not hesitated to embark on building lines despite the obvious difficulties and high cost of construction.

A case in point is the section of the late Great Northern Railway in the coal areas of Nottingham and Derbyshire. Prior to extensive working of these coal deposits, the late Midland Railway had the district practically to itself, but when colliery development became general the Great Northern Railway was to the fore quickly with important extensions. In the 'eighties and 'nineties the Manchester, Sheffield and Lincolnshire and Lancashire, Derbyshire and East Coast railways also constructed largely in the same area.

The engineering works on the Great Northern line in the district are of considerable magnitude; tunnels, deep cuttings and viaducts abound. Two of the last are important features in railway engineering. One, of brick, known as the Kimberley Viaduct, is on the Pinxton branch, close to Awsworth Junction. There are 45 spans, of a total length of 1,716 ft. The viaduct is on a reverse curve and is officially described as four viaducts. The first is Giltbrook Viaduct of one span of 27 ft. and 13 of 30 ft. each. The second section carries the Great Northern Railway across the Bennerley-Bullwell branch of the late Midland Railway; it has 16 spans—one of 27 ft. and 15 of 30 ft. The third part is over the Digby Colliery sidings and comprises a span of 27 ft., three of 30 ft., and one of 8 ft. 6 in., whilst the remaining section carries the railway across the Nottingham Canal, and consists of a segmental arch of 45 ft. span, a semicircular arch of 8 ft. 6 in. span, and eight spans each of 30 ft. The other important viaduct across the Erewash Valley is of steel. It is near the Kimberley (Awsworth) Viaduct just described, but on the main line to Derby, and commences about a mile beyond the Pinxton branch junction. Known as the Ilkeston Viaduct, it is 1,452 ft. in length, the rail level being 56 ft. above ground at the highest point. The piers are of wrought iron, the girders are of lattice type; there are 16 spans, 14 being each 77 ft. long and the two others 73 ft. 7 in. each. At the west end the viaduct is continued by an iron girder skew bridge of three spans across the late Midland Railway; the girders are supported on brick piers. On the skew the spans measure 35 ft. 4½ in., 52 ft. 4 in., and 26 ft. 5½ in., respectively. The Ilkeston Viaduct and skew bridge were erected in 1878.

First-class Carriages as Sleeping Quarters.

ABNORMALLY high temperatures in July made the palatial free hotels of the homeless—first-class railway coaches in carriage sidings—too stuffy for those who are always upon the look-out for a comfortable gratuitous bed. For many years the railways suffered from the visits of these unbidden and quite undesirable guests. Under cover of darkness men of the genus tramp make a practice of selecting for their night's lodging first-class carriages stored in sidings in the vicinity of London and large towns. The cushions removed from the seats were placed on the floor, which not only provided a wider couch for the intruder, but made his presence in the carriage less likely to be observed save by most vigilant watchmen. Some railways adopted the plan of upholstering first-class coaches with fixed seats as a means of circumventing the operations of these tramps. The Hornsey carriage sidings of the late Great Northern Railway were specially favoured. A public footpath runs between these and the Metropolitan Water Board's reservoirs and is little frequented, giving the undesirable an opportunity of getting into the coaches unobserved, despite the care of the watchman employed to warn off and otherwise deal with such trespassers. The state of these appropriators of free sleeping quarters was a menace to the traveller; not only were they potential carriers of infectious diseases, but many left behind parasitical vermin of a particularly loathsome kind. A night spent by one of these undesirables in a first-class carriage of the late Lancashire and

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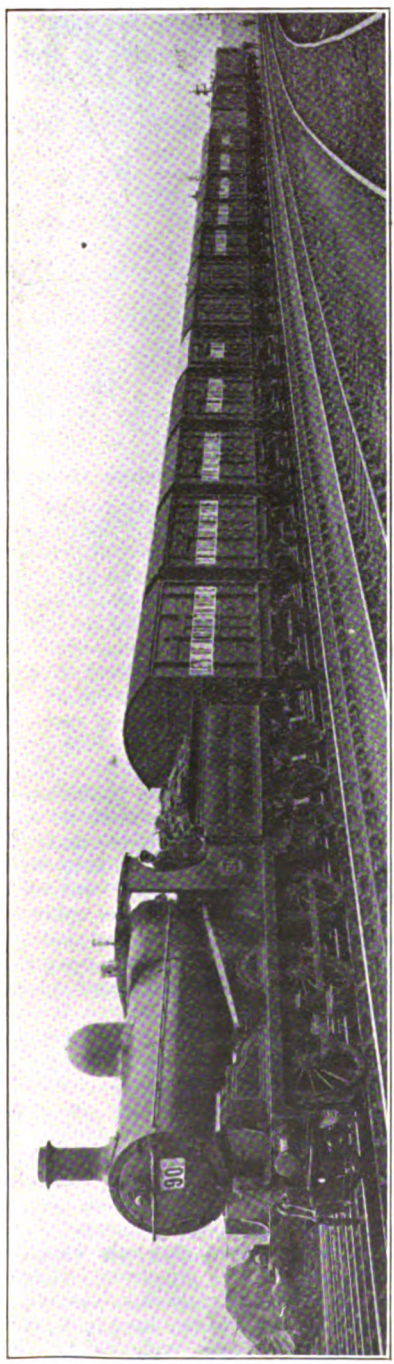
Yorkshire Railway put the company to an expense of £60 in disinfecting and re-upholstering the vehicle. The Lancashire and Yorkshire Railway, as a result of the growth of the habit of using first-class carriages for free beds, obtained statutory powers to charge offenders, the penalty being a fine of 40s. and payment of the cost of making good damage done to the carriage.



SPECIAL TRAIN OF BILLIARD TABLES FROM ACCRINGTON TO LONDON, LONDON MIDLAND AND SCOTTISH RAILWAY.

Improved Station Accommodation at Aberystwyth.

THE Great Western Railway is engaged in such big schemes of station enlargement and ancillary works—a quarter of a million is to be spent at Newton Abbot—that the money to be expended at Aberystwyth, although a good sum, appears a trivial amount. Prior to the Cambrian Railways being included in the Great Western Group, Aberystwyth station was joint Cambrian and Great Western—the latter becoming part owner in 1906, when the Manchester and Milford Railway was leased to the Great Western Railway for 999 years.

The present station at Aberystwyth has five platform lines; Nos. 1 and 2 are alongside the faces of one platform, No. 2 being of great length; No. 3 serves the principal arrival platform, on the other side of which is a short dock (No. 4). No 5 line also serves a short dock. In the days before the Cambrian railways were absorbed in the Great Western group, although Great Western Railway coaches regularly worked over the 64½ miles from Buttington to Aberystwyth, naturally most Great Western Railway trains approached the terminus over the old Manchester and Milford route. The junction between the two railways is immediately at the arrival end of the platforms, only 176 yards from the buffer stops, but to enable shunting and other traffic arrangements of the Manchester and Milford Railway to be carried out, the Cambrian Railways' line for 25 chains before the junction, and the Manchester and Milford Railway's line for 20 chains from the same point, were made joint. Prior to the grouping, Aberystwyth station in the season was notable for the number of "foreign" railways whose coaches regularly worked to and from it. Dealing only with those via the Cambrian Railways, there were London and North Western and Great Western, joining the Cambrian system at Buttington Junction, 64½ miles distant, from London, Birmingham, &c., Great Central joining at Wrexham, 98 miles, London and North Western (from Liverpool, Manchester, &c.) at Whitchurch, 95¾ miles, and North Staffordshire, also via Whitchurch.

South Wales and Aberystwyth Through Services.

A SERVICE to and from Newport (Mon.) over the Brecon and Merthyr Railway between Tal-y-Llyn and Newport, was provided, Cambrian coaches working through.

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From Newport (Bassaleg) to Aberystwyth the first 42¾ miles to Tal-y-Llyn were over the Brecon and Merthyr Railway, but thence over the Cambrian line north-west to Moat Lane Junction, reversing there and then journeying south-west 43½ miles to Aberystwyth. Through services by Taff Vale Railway coaches to and from Cardiff and inland mining towns of South Wales over the same section of the Cambrian system from Tal-y-Llyn were also provided, whilst by means of Cambrian coaches a service to and from the same district to stations on the Rhymney Railway over the Cambrian line from Tal-y-Llyn was also run.

Doubtless these services from the local lines in South Wales, which only ran at the week-ends, were originally in competition with services from Great Western stations, which, prior to the Great Western Company absorbing the Manchester and Milford Railway, were worked by the latter between Pencader and Aberystwyth. Since the Great Western Railway assimilated the Manchester and Milford company, competition for the Cardiff and Newport-Aberystwyth traffic, although continued, has been out of the question. The holiday traffic from the mining towns in the interior of South Wales is still worked by the Great Western Railway via Tal-y-Llyn and Moat Lane. The through Aberystwyth coaches now start from Treherbert on Mondays and Saturdays, leaving at 9.50 a.m. and due at Aberystwyth at 4.45 p.m. On the same days a train leaves Treherbert at 9.40 via Port Talbot, Llanelly and Carmarthen, arriving at Aberystwyth at 2.35 p.m. It will be observed that the late Midland Railway coaches were not to be seen at Aberystwyth. This absence is conspicuous, as many people had the idea that Midland coaches were ubiquitous at popular resorts.

Chinese Railways.

In connection with the article published in the June number, Mr. Cecil G. Howsin points out that no reference was made to Mr. Claude Kinder, C.M.G., M.Inst.C.E., &c., or to Mr. George Dundas Churchward, M.Inst.C.E., to whom, as Engineer-in-Chief and General Manager, and Locomotive, Carriage and Wagon Superintendent respectively, the successful initiation and pioneering of the first working line, the Imperial Railways of North China, was due, as also the fixing of 4 ft. 8½ in. as the standard gauge of China. "In fact, Mr. Kinder is the George Stephenson of that country." Mr. Howsin continues :—"During the troubles with Russia in 1897 and 1898, I served with Mr. Kinder and Mr. Churchward as the first Assistant Locomotive, Carriage and Wagon Superintendent ever to take service in China, and I well remember the difficulties we had in attempting to get railway working properly recognised. In fact, it was due solely to the loyalty and determination of the locomotive, carriage and wagon department and its senior locomotive inspector, Mr. J. Moffat, working under great difficulties, that success was assured."

Summer Services to North Cornwall.

Holiday traffic to the West of England grows in volume year by year, largely as a result of the attractive advertising of the Great Western and Southern Railways. The resorts on the north coast of Cornwall are particularly favoured. It, therefore, comes as somewhat of a surprise to find that there is but one practical service provided between London and Newquay, the 11.10 a.m. from Paddington (11 o'clock on Saturdays). The other trains from Paddington to Newquay shown in the Great Western Railway time-tables are :—5.30 a.m., 10 p.m., and midnight (12.30 a.m. Sundays). The service is not quite so meagre as it appears. By travelling by the 10.30 a.m. and changing at Plymouth (North Road) into the Birmingham-Newquay through train, Newquay can be reached at 5.6 p.m. The 12.5 p.m. from Paddington, due at Plymouth (North Road) at 5.39 p.m., provides another service. The express from Liverpool leaves North Road at 6.28, with a connection Par to Newquay, due at the latter town at 8.32 p.m. The frequent rail motor service between Truro and Newquay does not apparently benefit travellers between London and Newquay, except on Sundays, when there are no trains on the Par-Newquay branch. The distance by the Chacewater route is 16½ miles longer than via St. Blazey.

Padstow, a smaller popular resort on the north coast of Cornwall, has three good services from Waterloo at 9 and 11 a.m. and 3 p.m., whilst the 11.10 a.m. from Paddington catches the 11 a.m. from Waterloo at Wadebridge, with a margin of 46 min. There is also a connection with the 3 p.m. from Waterloo, off the 2 p.m. from Paddington. In the up direction passengers leaving Padstow at 9.35 a.m. reach Waterloo at 4.30 p.m., and Paddington 5 min. later, but by the 12.35 p.m. Paddington passengers, handicapped by a 56 min. wait at Wadebridge, reach Paddington at 9 p.m., half-an-hour later than the Southern Railway contingent reaches Waterloo. On the second Monday in each month and on Wadebridge cattle sale days there is a train from Padstow at 11.20 a.m., enabling passengers to reach Paddington at 6.50 p.m. This train has no connection to Waterloo. The Great Western Railway route is 9¾ miles further

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than by the throughout route of the Southern Railway, by which the distance is 259¾ miles. The 5¾ miles Padstow to Wadebridge are covered in 9 min., a good speed for so short a run. The Great Western Railway trains run over the Southern Railway from Boscarne Junction (Bodmin) to Wadebridge, a distance of 4 m. 62 ch., and the train service of the foreign railway is, of course, subservient to that of the owning company.

Railway Nomenclature for Inn Signs.

In the early days of railways—after they had overcome their first unpopularity—many inns and public houses sought to identify themselves with the railways, particularly if near a station. Hence the "Railway" Hotel, Tavern, Inn or Arms became common signs, whilst if a rival house were permitted, it frequently adopted the name of "Station" Hotel, Arms, Tavern or Inn. A third licensed house would use the name of the Railway, *e.g.*, "The Mid Kent Tavern" in the railway approach at Lewisham, "The London, Chatham and Dover Tavern" at Battersea, "The London and Brighton" at Peckham, &c. If the station happened to be a junction, "Junction Hotel" Tavern, &c., was employed, either in addition to railway and station, or as an alternative. Inns near railway stations sometimes added a second title to connect them with railways, such as "Ye Old Cherrie Tree and Railway Hotel" at East Dulwich, the "East India Arms and Railway Stores" in Fenchurch Street. Railway apparatus was also pressed into service to connect the licensed house with the new mode of locomotion. Inns designated "Railway Bell," "Railway Signal," "Railway Telegraph" are dotted about the country contiguous to railways.

In new districts, developed to accommodate a railway colony, such as around Chalk Farm, when the London and Birmingham Railway made that place its locomotive depôt, we find "The Locomotive" and "The Engineer." "The Semaphore" and "Telegraph" used as inn signs, may belong to an earlier time, and have reference to the Admiralty system of telegraphing by means of semaphores, placed on hills. In a side street near Paddington Station is "The Queen's Railway Tavern." This title can convey more than one meaning; probably it means that as Queen Victoria travelled mostly by the Great Western Railway and to and from Paddington, the Great Western Railway was the "Queen's Railway." In this instance we believe that when Queen Victoria was alive the sign was "Queen Victoria's Railway Tavern"—rather suggestive of royal patronage of this hostelry, when travelling by railway.

The extension of the Blackwall Railway to Fenchurch Street caused the East India Arms at the corner of the street in which the terminus is situated, as already noted, to add "Railway Stores" to its name. Opposite to the station "The Blackwall Railway Tavern" was opened, and adjacent to the station "The Railway Tavern" commenced business. All these hostelries still flourish, and etched on the glass panels of the doors of the last may be seen representations of a 2-2-2 locomotive and 4-wheeled tender of 80 years ago. Outside Tubs Hill station, Sevenoaks, there is an hotel, that, judging by its name, was opened a few years after the railway station and in quite the early days of the cycle. The name is "The Railway and Bicycle Hotel," by which it sought to attract the patronage of travellers by both rail and road. Around Tonbridge station, as a result of the coming of the railway, a new district grew up, with a plentiful supply of licensed premises. These desired to show their close connection with the iron way, and are named, "South Eastern Hotel," "Station Tavern," "Railway Arms," "Station Bridge Hotel," "Telegraph Inn" and "Railway Bell."

Railways Turn the Tables.

But if the hostelries made good use of the railways by endeavouring to associate themselves with rail transport, by means of their signs, it must not be forgotten that the railways set the example. Railway stations named after public houses are not rare. "Elephant and Castle" and "Royal Oak" are well-known London examples of railways adopting the nomenclature of a widely-known inn in the vicinity of a station. The *tubes* adopted also the former of the twain and added "The Angel" to the list. Other well-known signs of inns adopted as names for railway stations that will readily occur to our readers include Bay Horse, Blue Anchor, Cross Inn, Horse and Jockey, Boars' Head, Craven Arms, Berney Arms, Black Bull, &c.

A Liberal Business Train Service.

The summer train services of the South Eastern and Chatham Section of the Southern Railway provide Tonbridge with two fast business trains to town, at only 5 min. intervals—something unusual for a town 30 miles distant from London and, moreover, of no great size. Prior to July 9, the 7.55 a.m. from Folkestone Central left Tonbridge at 9.15, called at Sevenoaks (9.30–31), and was due at London Bridge at 10 o'clock. This train now leaves Tonbridge 3 min. earlier (at 9.12), calls at Knockholt (9.36)

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instead of Sevenoaks, and is still due at London Bridge at 10 a.m.

A new train starts from Tonbridge at 9.17, calls at Hildenborough (9.22) and Sevenoaks (9.34), and is due at London Bridge at 10.4, therefore occupying 1 min. less on the journey than the 9.12, although it makes two stops *en route* against one by the 9.12. The timing of the new train is, however, 2 min. more than that of the old 9.15 a.m. The running of this additional train from Tonbridge has become possible consequent upon the acceleration of the up "City Express," which by various small improvements in running and alterations now leaves Faversham at 8.44 a.m. and reaches London Bridge at 9.48, an acceleration of 11 min. on the non-stop run of 49 miles.

The new train from Tonbridge occupies the former "path" of the "City Express" from Chislehurst to London. Extremely punctual running is necessary with the four trains concerned; otherwise an elaborate time-table is upset completely. From Chislehurst to London Bridge the up main line is occupied by the 8.10 ex Hastings, Chislehurst pass 9.34½; 8.3 ex Margate West, Chislehurst pass 9.36½; 7.55 ex Folkestone Central, Chislehurst pass 9.45½, and 9.17 ex Tonbridge, Chislehurst pass 9.48½; in the interval between the Margate and Folkestone trains two others run on the main line, a Mid-Kent train (from Parks Bridge Junction) and a stopping train from Bromley North (from Grove Park). The 9.17 ex Tonbridge is usually hauled by a 0–6–4 tank engine, an innovation for fast services on this portion of the South Eastern and Chatham Section, where any tank engines are exceptional. The evening down service to Tonbridge now includes expresses from Charing Cross at 6 o'clock to Dover and Deal, and at 6.3 to Hastings. The former is non-stop London Bridge to Tonbridge (arrive 6.45 p.m.), the latter calls at Sevenoaks as well as London Bridge, and is due at Tonbridge at 6.54.

Paris-Brussels Non-stop Trains.

REFERRING to the non-stop service between Paris and Brussels, inaugurated in June by the French Nord and Belgian State Railways, of which some particulars were given last month, one of our Paris readers, Mons. Mulotte, sends some interesting remarks, from which the following notes may be extracted:—The distance is 192·8 miles. The e ines used are of the Nord "Pacific" type, series 3.1151 to 1170, fitted with large bogie tenders carrying about 7,800 gallons of water. These tenders weigh, when full, some 65 tons. They were taken over from the Germans at the Armistice and have been put on the engines engaged on the Brussels non-stop service in place of the standard six-wheel Nord tenders. The non-stop trains are made up of six corridor coaches carrying first and second-class passengers only, and weigh, with a full complement of passengers, railway and customs staff, between 215 and 220 tons. The trains leave Paris and Brussels

Speed.	Time.	Distance		Distance	Time.	Speed.
	Min. Sec.	Miles.		Miles.	Min. Sec.	
—	0 0	0·0	Paris (Nord)	192·8	225 0	48·5
43·5	5 16	3·8	St. Denis	189·0	220 18	69·3
63·1	18 0	17·2	Summit	175·6	208 42	47·7
60·9	31 48*	31·2	Creil	161·6	191 5*	51·8
41·7	36 23*	34·5	Rieux Angicourt	158·3	—	—
35·5	42 58	38·4	Pont Ste. Maxina	154·4	182 46	64·9
62·7	55 30	51·9	Compiegne	140·9	170 17	50·2
68·6	68 16	66·5	Moyon	126·3	152 50*	60·5
63·3	82 18	81·3	Tergnier	111·5	138 10	59·5
59·1	96 18	95·1	St. Quentin	97·7	124 15	62·0
55·6	114 33	112·0	Busigny	80·8	107 54*	42·3
63·5	120 2	117·8	Le Cateau	75·0	99 40	66·2
57·3	136 53	133·9	Aulnaye	58·9	85 5	60·2
41·4	150 13*	143·1	Feignies (Frontier)	49·7	75 55	38·4
42·3	167 24†	155·2	Mons	37·6	57 2*	45·5
46·3	182 58	167·2	Neufvillers	25·6	41 12	44·3
45·2	192 23	174·3	Braine le Conte	18·5	31 35	24·0
27·6	200 25‡	178·0	Heunuyeres	14·8	22 20‡	47·5
48·9	204 13	181·1	Tubize	11·7	18 25	50·5
41·9	208 48	184·3	Hal	8·5	14 37	34·9
31·6	224 58‖	192·8	Brussels (Midi)	—	—	—

* Speed reductions. † Signal delays. ‡ Slack for single-line tunnel. ‖ Slow approach.

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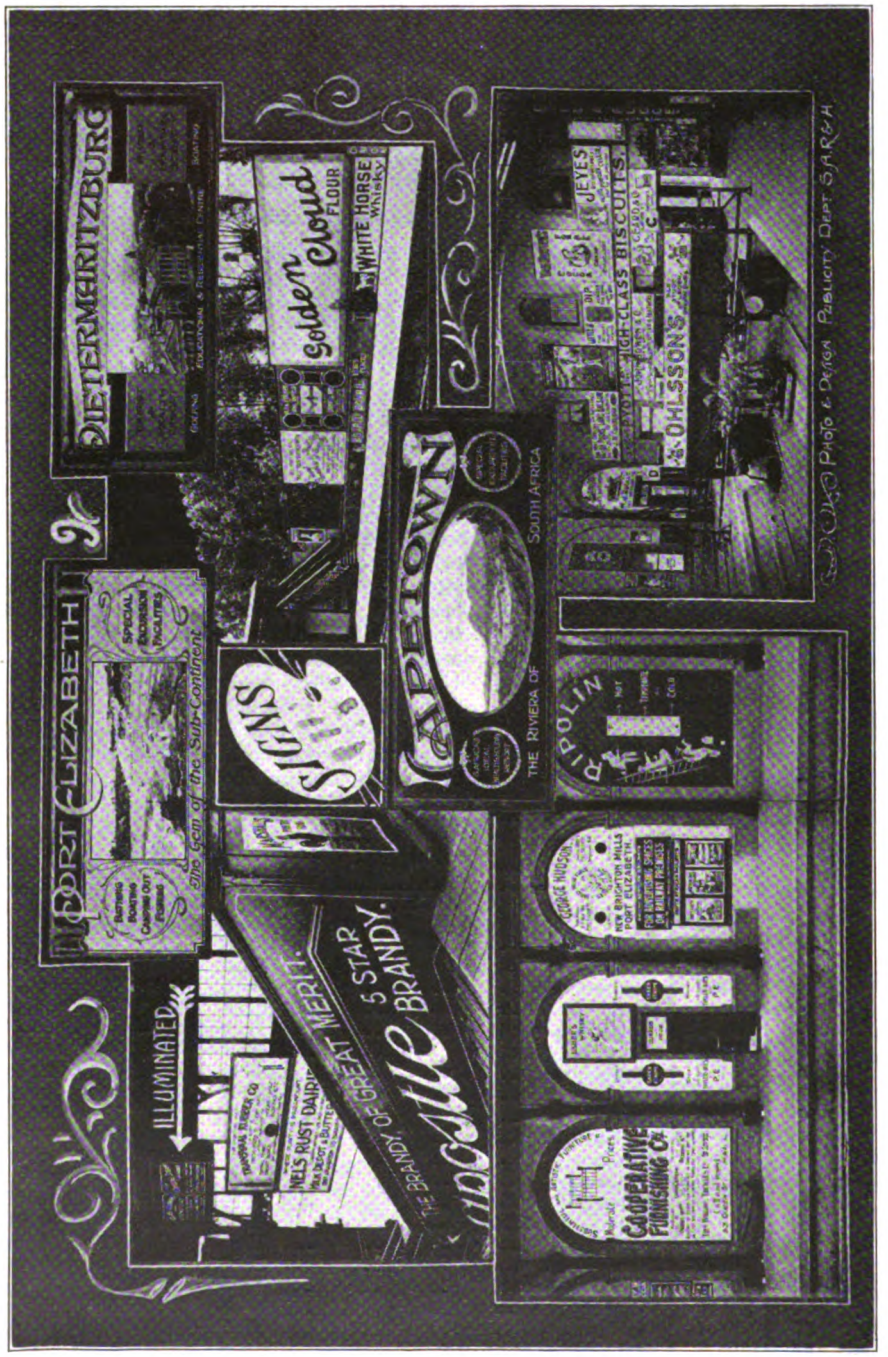

PUBLICITY AND ADVERTISING METHODS, SOUTH AFRICAN RAILWAYS.

COMPOSITE VIEW OF ADVERTISEMENTS IN SPECIAL POSITIONS.

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at 2.15 p.m., and are due in Brussels and Paris at 6 p.m., thus taking 3 hours 45 min. for the 192·8 miles, giving an average start-to-stop speed of 52·4 miles. This is not very high, but it must be remembered that, on the Belgian line, from the frontier to Mons and Brussels, the highest permissible speed is only 60 m.p.h., if not less. There are also severe speed restrictions at various places, through Mons station and yards, and at the tunnel north of Braine le Conte, where single-line working is in force and a pilot-man has to be taken on board the engine.

On the French lines the principal speed restriction is at Creil, where speed is restricted to about 45 m.p.h. Gradients are generally easy, but the following banks must be noted:—Between Pierefitte and Survilliers, about 11 miles, ascending at an average a little under 1 in 200; after Survilliers the line falls for about 12½ miles at 1 in 200 to a point near Creil station. Before St. Quentin is passed there is a bank of 10½ miles at about 1 in 333. Between St. Quentin and Busigny another rise occurs at 1 in 200, extending for some 11 miles, followed by a descent at 1 in 333 for 6 miles and another rise at 1 in 200 for 7 miles past Le Cateau station. From Le Cateau to Aulnaye, where the line to Liege and Cologne diverges, there are constant undulations. After Aulnaye there is a rise to the frontier station of Feignies.

After Belgian territory is entered upon there comes a steep descent of about 10 miles to a point near Mons, much of which is at 1 in 220. From Mons to Neufvillers, a distance of about 12 miles, the line rises at an average of 1 in 250. Then, after some undulations to Braine le Conte, comes a 1 in 200 average descent of about 6¾ miles to Oubize. This descent cannot be of any use to the Brussels-bound trains, as it comprises the stretch of single line working through the tunnel referred to above. Also the descent from the frontier to Mons does not allow of fast running, as there exists on this stretch many curves and speed restrictions.

Record of a Through Journey.

MONS. MULOTTE also gives particulars of a double trip on one of these trains as follows:—"I had occasion to travel to Brussels and back during the month of June by the new non-stop express, and I give you an abbreviated log. (*See* page 243). The engine in each case was No. 3.1162. I may add that it is hoped to bring down the running time between Paris and Brussels by the non-stop trains to 3 hours 35 min., when improvement and repair works now in hand in Belgium are finished. It is also suggested that a second non-stop service shall be introduced between Paris and Brussels later on, the present one being exceedingly well patronised. The engine crew is, of course, a French Northern one, but a Belgian locomotive inspector accompanies the train on the footplate.

"In both runs 14 min. were lost owing to various slacks (signals, relaying, works), and in each case the engine exactly regained the time lost, so that the arrival at the end of the journey was punctual. All losses accounted for, the running in Belgium was poor and could be easily quickened. On the French Nord, on the contrary, the average speeds, with losses accounted for, work out at 60 m.p.h. one way and 60·3 m.p.h. the other way over a distance of 143·1 miles, which is distinctly good, notwithstanding the light train load. On the outward journey, speed on the 1 in 200 bank after Pierrefitte never fell below 60 m.p.h. On that same journey a distance of exactly 63 miles was covered in one hour and 17 sec., notwithstanding 10½ miles ascending at 2 in 333 and 5 miles at 1 in 200, not taking into account various shorter banks."

Railway Accidents in 1922.

THE Report by the Chief Inspecting Officer, Ministry of Transport on the accidents that occurred on the railways of Great Britain during the year 1922 has just been issued. The accidents are grouped under the three main heads of (1) Train accidents; (2) Accidents caused by the movement of trains and railway vehicles, exclusive of train accidents; and (3) Accidents on railway premises not due to train accidents or to the movement of trains and railway vehicles. The total numbers of persons killed or injured by accidents in connection with the working of railways were:—Killed, 728; injured, 19,462.

The twenty-eight accidents inquired into by the Inspecting Officers of the Ministry may be allocated, in respect of primary cause, thus:—(*a*) Failure or insufficiency of equipment—(1) Engines and rolling-stock, 6; (2) Signalling and permanent way, 5. (*b*) Failure of enginemen to obey or observe danger signals, 6. (*c*) Failure of enginemen to give effect to regulations, 3. (*d*) Failure of signalmen to observe or give effect to regulations, 3. (*e*) Failure of employees other than enginemen and signalmen to give effect to regulations, 4. (*f*) Faulty method of marshalling for high speed, 1. In seven of these cases a system of automatic train control would, it is suggested, have prevented accident. The use of a continuous brake on freight trains would have prevented two accidents. Improvements in design, in material and in methods of examination and of fastening were noted as likely to have beneficial effect in five cases. A

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modern type of facing point equipment would have prevented one accident, and an alteration in the method of working movable diamond points would have prevented a second.

The general conclusions are that in respect of maintenance of equipment, there is still, in certain directions, some leeway to make up before the high pre-war standard is attained, and the need of a system of Automatic Train Control as a method of providing greater security against accident continues to be proved.

Accidents caused by the Movement of Trains, &c.

DURING the year 568 inquiries were held by officers of the Ministry into accidents falling within this class. It is difficult to assign more than 4·94 per cent of the accidents to preventable causes, but in all such cases recommendations have been made, and necessary action, where reasonably practicable, has been taken with good effect. Many cases of accidents into which formal inquiry was not made were dealt with by correspondence with good results. It is satisfactory to note that substantial reduction in the number of cases of accident, both fatal and non-fatal in character, continues to be general as compared with years prior to 1921.

The great bulk of the casualties to passengers in Class 2 are due to misadventure, or are caused by want of caution, or misconduct on the part of the persons concerned. During 1922 there were 24 fatal and 40 non-fatal cases of casualty by falling out of carriages during the running of trains. They include accidents caused not only by failure of door fastenings, but also cases of misconduct such as drunkenness, overbalancing when seated on a carriage window, unproven suicide, and evasion of ticket collection. It is not therefore considered that the figures justify pressure being brought to bear on railway companies to adopt one of the numerous patents for controlling the locking and unlocking of carriage doors, more especially as such devices may add to the difficulty of the rescue of passengers in case of accident.

As regards servants of the companies, 69·5 per cent. of the total accidents are similar in origin to those incidental to any industrial enterprise, and no considerable reduction can be expected. In 25·67 per cent. of the cases the accidents were attributable to want of caution, and these could be reduced. The desirability of education in personal carefulness is again emphasised.

There has been a further reduction in the total cases of coupling and uncoupling accidents. There also continues to be a considerable and uniform reduction in accidents to men engaged upon the permanent way, but the number is still lamentably high.

Accidents on railway premises, for the most part, are not attributable to railway working, and should not properly be classed as railway accidents. Of the 13,054 non-movement accidents, 12,484 or nearly 96 per cent. may be described as industrial accidents of a more or less non-preventable character. Inquiries were held by officers of the Ministry into 55 cases.

Mirrors for Assisting Signalmen.

A SIGNAL-BOX mirror erected recently at Stratford station, Great Eastern Section, London and North Eastern Railway has received considerable attention in the newspaper press, but the use of a mirror for giving signalmen a reflected view of lines and signals out of their sight is not a novelty. Probably the earliest use of such mirrors was when W. R. Sykes, in November, 1883, fixed his electrical signals at the Hole-in the-Wall signal-box, Victoria, when a mirror was provided at each end of the box. A novel use of mirrors was that made some 30 years ago at Baxenden on the Lancashire and Yorkshire Railway to give the signalman a view of the highway behind his box so that he should not shut his gates when a vehicle was approaching on the heavily falling gradient. Later a mirror was provided at Chorley, but because of the busy road traffic. With the great growth since then of motor vehicles such an aid to signalmen has no doubt been adopted more generally. It is questionable whether, in these days of track circuit locks and train-waiting-at-signal indicators, with visual signals over the levers to which they apply, a signalman should be compelled to rely on the reflected view of a mirror fixed outside the box and necessarily at the opposite end to that where are the levers and block instruments concerned.

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MISS E. L. WINTERTON, a draughtswoman in the Signal Engineer's office of the Great Western Railway at Reading, at a recent meeting of the Council of the Institution of Railway Signal Engineers, was elected the first lady associate member. Miss Winterton, who commenced work in the drawing office in 1915, and was appointed draughtswoman in 1917, has been engaged in making wiring diagrams of electrical signalling appliances in connection with track circuits, signal and point machines, &c. In connection with her studies at the University College, Reading, she has passed examinations in machine construction and drawing, electricity and magnetism, applied mechanics, general physics and mathematics. Miss Winterton was awarded the Owen Ridley prize for machine construction in 1919-20, and the Wells prize for science in 1921-22.

* * *

THE Hon. Charles Napier Lawrence, Chairman of the London Midland and Scottish Railway, upon whom a barony has lately been conferred, has taken the title of Baron Lawrence of Kingsgate, of Holland House, Kingsgate, in the County of Kent.

MISS E. L. WINTERTON,
Elected First Lady Associate Member, Institution of Railway Signal Engineers.

* * *

MR. D. L. RUTHERFORD, formerly Engineer of the old Furness Railway, has retired from railway service and intends to practise as a consulting engineer in Edinburgh. Mr. Rutherford became Engineer of the Furness Railway in 1909, and during his tenure of office was responsible for much important work, including the reconstruction of the permanent way and the renewal of over 50 bridges and viaducts. He is a member of the Institution of Civil Engineers and a Fellow of the Permanent Way Institution (President in 1912), and held the rank of Major in the Engineer and Railway Staff Corps, R.E. (T.A.).

* * *

MR. E. ROBINSON, Divisional Commercial Superintendent of the London and North Eastern Railway at Cambridge, retires as from August 31, after 50 years' railway service. Mr. Robinson has been at Cambridge since October, 1915, when he succeeded Mr. A. C. Hutcherson as District Goods Manager for the Great Eastern Railway. He entered the service of the Great Eastern Railway in 1873 in the Superintendent's Department at Harleston. In 1886 he became Goods Agent at Tufnell Park, and in 1895 he was appointed Chief Livestock Agent to the company, with headquarters at Cambridge. In October, 1913, he was made the Great Eastern Agent for Manchester and district, extending from Carlisle to Stafford, but returned to Cambridge two years later, as above stated.

* * *

MR. EDWIN ARNOLD CLEAR, who was Assistant General Manager of the Great Central Railway, has been made Assistant Divisional General Manager, Southern Area,

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MR. E. A. CLEAR,
Assistant Divisional General Manager,
Southern Area,
London and North Eastern Railway.

MR. C. A. LAMBERT,
Passenger Manager,
North Eastern Area,
London and North Eastern Railway.

MR. F. BUSHROD, O.B.E.,
Chief Assistant to the
Chief Operating Superintendent,
Southern Railway.

MR. F. A. BRANT,
Continental Traffic Assistant, attached
to the Chief Commercial Manager,
Southern Railway.

MORE "GROUPING" APPOINTMENTS.

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London and North Eastern Railway. Mr. Clear began his railway career in Great Northern service, and in 1898 transferred to the Great Central Railway and became the first District Superintendent of the new line to London in 1900. Afterwards he held various appointments in the provinces. It was in March, 1919, that Mr. Clear became Assistant General Manager, Great Central Railway.

* * *

MR. C. A. LAMBERT, who has been appointed Passenger Manager of the North Eastern Area, London and North Eastern Railway, held the position of Divisional Goods Manager of the North Eastern division of the North Eastern Railway, with headquarters at Newcastle-on-Tyne, since 1913. A son of the late Mr. Henry Lambert, a former General Manager of the Great Western Railway, Mr. Lambert entered Great Northern service in 1890. Ten years later he went to the North Eastern Railway and held various appointments at Hull, York and Middlesbrough before going to Newcastle-on-Tyne.

* * *

MR. F. BUSHROD, who has been made Chief Assistant to the Chief Operating Superintendent, Southern Railway, began railway life at Southampton Docks station in 1891, and two years later was transferred to headquarters at Waterloo. He became Assistant Superintendent of the Line in 1916. Throughout the reconstruction and enlargement of Waterloo Station, Mr. Bushrod was associated with traffic questions relating thereto. He was chairman of the Committee concerned in the lay-out and equipment of the Feltham Concentration Yard and for the formulation of traffic methods consequent upon its use.

* * *

MR. F. A. BRANT, who now becomes Continental Traffic Assistant, attached to the Chief Commercial Manager of the Southern Railway, has held since July, 1920, the position of Continental Traffic Assistant to the General Manager of the South Eastern and Chatham Railway. In 1889 Mr. Brant entered the service of the London, Chatham and Dover Railway, and after a varied experience in different departments he was transferred to the Continental Traffic Manager's office and became Chief Clerk in due course. In 1914 he was appointed Inspector of Continental agencies, with headquarters at Boulogne. Then came the war, and Mr. Brant, by reason of his expert knowledge of Continental languages and his practical acquaintance with European railway practice, was called upon to perform extraordinary services for the War Office Intelligence Department and in organising certain Continental railway traffic, services which have been officially recognised both by Italy and Belgium.

* * *

MR. C. G. DANDRIDGE, who has become District Passenger Manager for the Manchester District of the London and North Eastern Railway, began railway life in the General Manager's office on the Great Central. During the war he did remarkable military railway service in Russia. Then after acting as District Traffic Manager of the Anatolian Railway, Turkey, he returned to England, and was made Assistant District Traffic Manager, Great Central Railway, Manchester.

* * *

ACCIDENTS to railway employees are not so numerous nowadays as in former years, but all the same the London "Safety First" Council considers the number far too high. With a view to reducing the number of accidents and also to further "Safety First" principles, the London "Safety First" Council is promoting a competition, open to all grades of railwaymen, including the clerical staffs, within a radius of 20 miles from Charing Cross. The competition is to be in the form of an original short paper. Each railwayman has his own views on the how and why of railway accidents—the cause and avoidance. Here, then, is the opportunity of airing these views and the possibility of receiving an award. No fee is payable in respect to the competition. The prizes will be as follows :—First, £3 ; second, £2 ; third, £1 ; and eight additional prizes of 10s. and a diploma in each case. Entry forms and full particulars may be obtained from the Joint Hon. Secretaries, London "Safety First" Council, 119, Victoria Street Westminster, S.W.1.

* * *

A FURTHER series of 2-8-0 "T" mineral locomotives has been constructed by the Great Western Railway. The new engines are numbered in the 5200 series. The steam pipes in these locomotives are carried through the walls of the smoke-box, following the arrangement adopted with the 4700 type of 2-8-0 mixed traffic locomotives.

* * *

Two "shed" visits have been arranged by the Railway Club for the month of September. The first takes place on Saturday, September 1, when the Kentish Town sheds of the London Midland and Scottish

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Railway will be inspected and the second on Saturday, September 22, when the Stratford engine sheds of the London and North Eastern Railway will be visited.

* * *

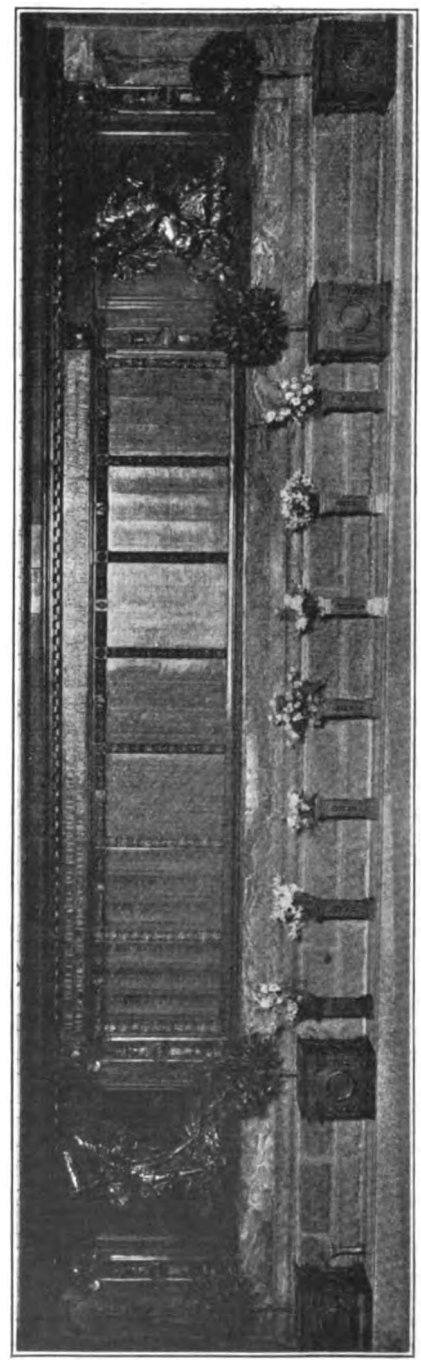
TUBE travellers on the Hampstead line are to have an opportunity of riding in the six Underground cars-de-luxe which were entered for the Rolling-stock Competition a few months ago, as described in the RAILWAY MAGAZINE, March, 1923. Each car has been conveyed through the streets from the Lillie Bridge depôt to the Golder's Green depôt, by means of special heavy road trucks. These "drawing rooms on wheels" —as they have been described—strike a entirely new note in rolling-stock design, and as the outcome of this competition 200 cars of similar type are now being constructed and will be put into service between Edgware and Moorgate, when the through running commences early next year.

* * *

THE memorial tablet which is situate on the north wall of Victoria Station booking hall, London Midland and Scottish Railway, Manchester, and was unveiled by Field-Marshal the Right Hon. Earl Haig, K.T., G.C.B., on February 14, 1922, has been further adorned by the laying down of a granite and marble platform, on which are erected four large and seven small ornamental bronze vases to contain shrubs and flowers. Relations and friends may place flowers in the vases which have been provided for this purpose, as shown in the illustration on this page.

* * *

ON page 180 there appears the reproduction of a photograph by F. E. Mackay showing the 4-cylinder 4-6-0 type locomotive No. 1166, *Earl Haig*, designed by Mr. J. G. Robinson, C.B.E., and built at the Gorton Works, passing Hadley Wood with the 4 p.m. train from King's Cross to Leeds. This engine, which belongs to the "Valour" class, has in the opposite direction been hauling the 10.15 a.m. from Leeds, due at King's Cross at 1.55 p.m. It is reported that its performance has proved satisfactory, and it has shown itself capable of climbing the stiff bank out of King's Cross with heavy trains in an efficient manner. On occasions it has passed Finsbury Park in six minutes after starting from the terminus. The distance is about 2½ miles, of which the bulk is on continuous up grades of 1 in 105 and 1 in 110. The start from King's Cross has been characterised as "perhaps the most difficult out of London." The engine has four 16-in. by 26-in. cylinders, coupled wheels 6 ft. 9 in., with a total heating surface of 2,387 sq. ft., and weighs in working order, with tender, 126 tons 4 cwt. The engines were originally built for service between Marylebone and Manchester, &c., but under the grouping system, in common with other



L. & Y.R. WAR MEMORIAL, VICTORIA STATION, MANCHESTER, WITH ALTERATIONS AS DESCRIBED ON THIS PAGE.

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"grouped" locomotives, they will have a much wider scope for their activities.

* * *

A HANDSOME new refreshment bar, with greatly increased floor space, has been opened by the Great Western Railway on No. 1 departure platform at Paddington. The old refreshment bar has been closed and will be utilised for the principal bookstall which will no longer project on to the platform.

* * *

FROM Mr. R. N. Micklewood there has come a cutting from the *Western Morning News*, July 25, which, under the title of "Easy Express Running," reads:—"On arrival at Plymouth, on Saturday, of the Cornish Riviera express, two spanners and a hammer accidentally left on the footboard of one of the coaches were found undisturbed after a journey of 225¾ miles, run at an average speed of 55 m.p.h. The impedimenta was returned to Paddington none the worse for its joy-ride." Commenting upon the circumstance recorded, Mr. Micklewood writes:—"With reference to Mr. H. Langford Lewis's remarks on page 157, August RAILWAY MAGAZINE, surely the incident related is a first-class certificate of smooth running? I have distinct recollections of being able to write a letter with perfect comfort in a Great Northern express train between Grantham and London. I certainly consider it would require very fine track and rolling-stock to beat our British products."

* *

A SURREY-SIDE reader writes:—"When taking water in many classes of tank engines it is necessary for the fireman to stand on the top of the side tank with nothing by which to steady himself. There is an element of danger in this, especially in stormy weather. On the Southern Railway (Brighton Section) one of Mr. Billinton's large E 6 X radial tanks has been fitted, with handrails on each side of the top of the dome, to obviate this danger. No. 407, the engine thus fitted, is stationed at New Cross."

* * *

AN illustrated history and description of the Ravenglass and Eskdale Railway, its locomotives and equipment, has been written by Mr. Henry Greenly, A.I.Loco.E., and published by Mr. R. Proctor Mitchell, General Manager, at the company's headquarters, Ravenglass, Cumberland, price sixpence per copy. As most RAILWAY MAGAZINE readers are aware, the line is of 15 in. gauge and is the smallest public railway in the world.

ORDERS have been placed for motors and control gear required for the electrification of the first section of the South Eastern and Chatham division of the Southern Railway, which covers the conversion to electrical operation of the suburban services within a 15-mile radius of Charing Cross. The equipment consists of no fewer than 508 traction motors, each of 300 h.p., with the appropriate controlling apparatus. The orders are possibly the largest for multiple unit equipments for main line railway electrification which have ever been placed. The work, which will give employment to many thousands of people, spread over a period of nearly two years, forms part of an expenditure of £5,500,000 which was the subject of a guarantee under the Trade Facilities Act.

* * *

RAILWAY grouping in Southern Ireland on a voluntary basis has been making such good progress that the Free State Government has not insisted on the time limit within which such schemes were to be submitted. The Great Southern and Western and Midland Great Western Railways have come to a provisional agreement for amalgamation, and the details of the agreement, as well as arrangements with some of the smaller companies, are under the consideration of the Government.

* * *

SPECIAL trains are run by railways for all sorts of purposes, and it is axiomatic that where bulk consignments offer special train working is of advantage. By the courtesy of Mr. G. Hawkins, Passenger Commercial Superintendent (Western Division), London Midland and Scottish Railway, we are able to publish on page 240 an illustration of a special train conveying 30 billiard tables from Accrington to London. As will be noticed, the train comprised 15 box wagons, all clearly marked with the name of the consignor, and was hauled by a six-coupled locomotive, No. 884. In accordance with the usual practice, the engine bore a special indication disc.

* * *

IT is expected that the reconstruction of Westminster station, which was begun in January last will be completed by about the end of September, when Westminster and the Houses of Parliament will have an entirely new station which will increase the working capacity of this busy centre by at least 50 per cent. There is a new booking hall with a battery of passimeters and a wide circulating area, a distinct advance

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on the narrow dingy booking hall of early Victorian days. A scheme of bright tiling has been introduced which will be a model for the new Underground stations. The benefit of the new station will be specially appreciated on the occasions of ceremonial functions when as many as 60,000 passengers make use of this station.

* * *

PICCADILLY Circus "Underground" station is to be rebuilt. The growth in traffic during recent years has made it imperative that a new station, affording better traffic facilities, should be constructed at once. The extraordinary growth in traffic at this station is indicated by the following figures: In 1907, the first complete year the station was open for traffic, 1½ million passengers used the station; in 1922, 18 million passengers used it. The new station will be about 15 ft. immediately beneath the Circus, and will be oval in shape, with a large circulating area, from which separate escalators will connect with the Bakerloo and Piccadilly lines, thus dispensing with the present lift service. In all there will be six escalators—a record for any one station. Three will feed the Bakerloo, and three the Piccadilly lines. The centre escalator in each group will be reversible, so that during the morning, evening and theatre peak, two escalators in each group can be run in either an upward or downward direction. The saving in time to the passengers will be enormous. The speeding up in the flow of traffic to the platforms means accelerating the loading of the trains. The powers that be are making provision for this by improving the loading facilities of the cars.

A SMILE-PROVOKING POSTER.

* * *

THE new Piccadilly Circus station will embody every known form of second-saving device. Fifteen passimeters will be installed. The theatre-going public should appreciate this, as it is hoped to practically eliminate booking queues. A broad subway under the Circus, completely encircling the booking hall, with be a feature of the new station. Seven entrances will be provided:—

2 on either side of Regent Street.
2 on either side of Messrs Swan & Edgar's.
1 at the corner of Glasshouse Street.
1 at the corner of Shaftesbury Avenue.
1 at the site of the present Tube station.

The subways will be available to the general public for crossing the Circus in safety by avoiding the street level. During the work of reconstruction, every effort will be made to inconvenience the public as little as possible. Regent Street, which is now being rebuilt, will probably house at least double its present population when completed.

* * *

A NEW facility for visitors to the Isle of Wight is the issue of weekly season tickets covering Ryde, Sandown, Shanklin, Ventnor, Newport, Cowes, and some 25 intermediate stations, available by all trains, for an unlimited number of journeys (first-class, 20s.; third-class, 15s.). Similar weekly season tickets (first class, 8s. 6d.) are also issued, available for as many journeys as the holder pleases by Southern Railway steamers between Ryde, Southsea and Portsmouth.

* * *

A WELL-KNOWN Pretoria engineer, Mr. A. Karlson, has submitted a new trans-African railway project to the press, by which Johannesburg would be linked by rail to Algiers, via a Central and West African route in a journey of under six days. Mr. Karlson is confident of a practical prospect for his scheme, and concludes his statement by saying that all rails required for the 6,000-mile route could easily be made at Pretoria from the vast local deposits of iron ore that are available.

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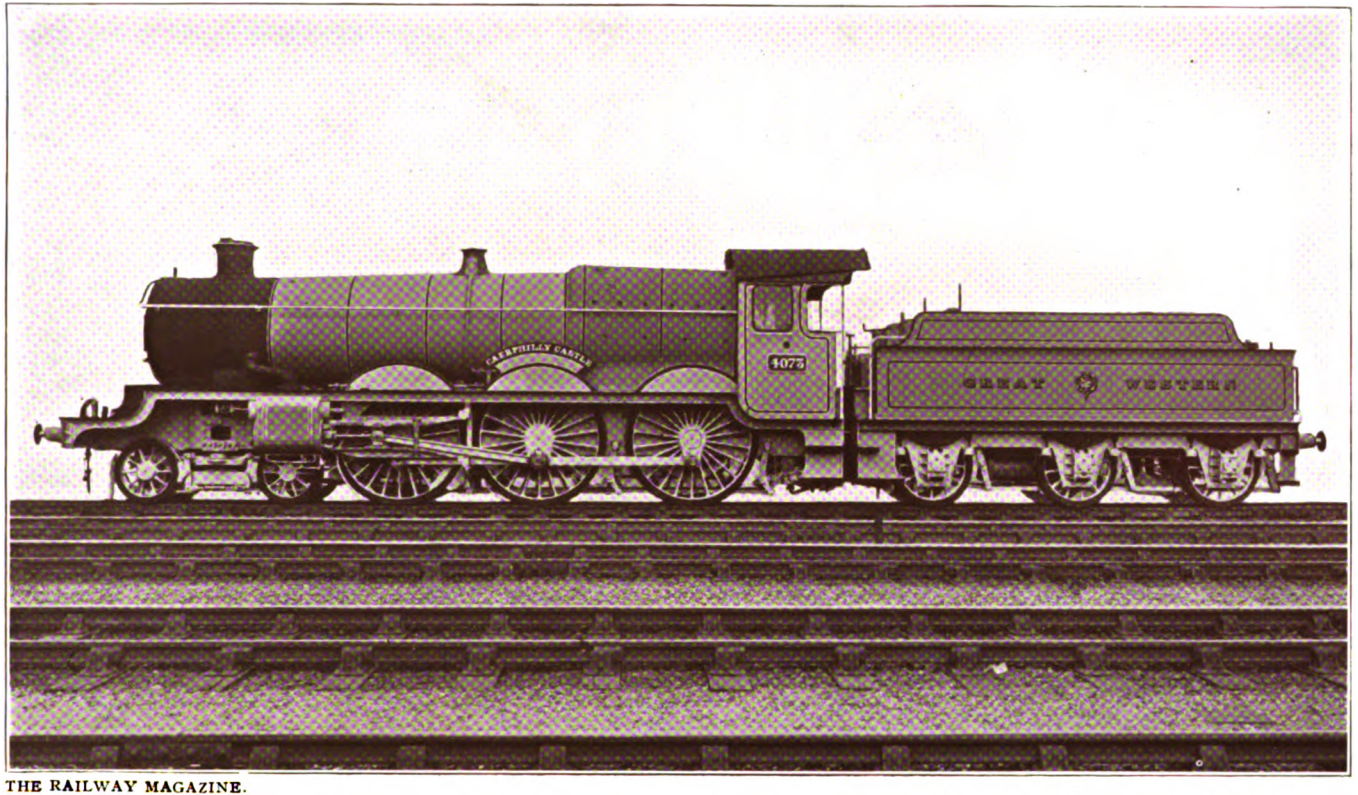

THE RAILWAY MAGAZINE.

NEW FOUR-CYLINDER 4-6-0 EXPRESS LOCOMOTIVE, GREAT WESTERN RAILWAY.

MR. C. B. COLLETT, C.B.E., Chief Mechanical Engineer.

Cylinders (4), 16 in. by 26 in.; Coupled Wheels, 6 ft. 8½ in. diam.; Bogie Wheels, 3 ft. 2 in. diam.; Steam Pressure, 225 lbs. per sq. in.
Heating Surface—Tubes, 1885·62 sq. ft.; Firebox, 163·76 sq. ft.; Superheater, 262·62 sq. ft.; Total, 2312 sq. ft.
Grate Area, 30·28 sq. ft. Adhesion Weight, 58 tons 17 cwts. Engine Weight (Working Order), 79 tons 17 cwts.
Weight of Engine and Tender in Working Order, 119 tons 17 cwts.

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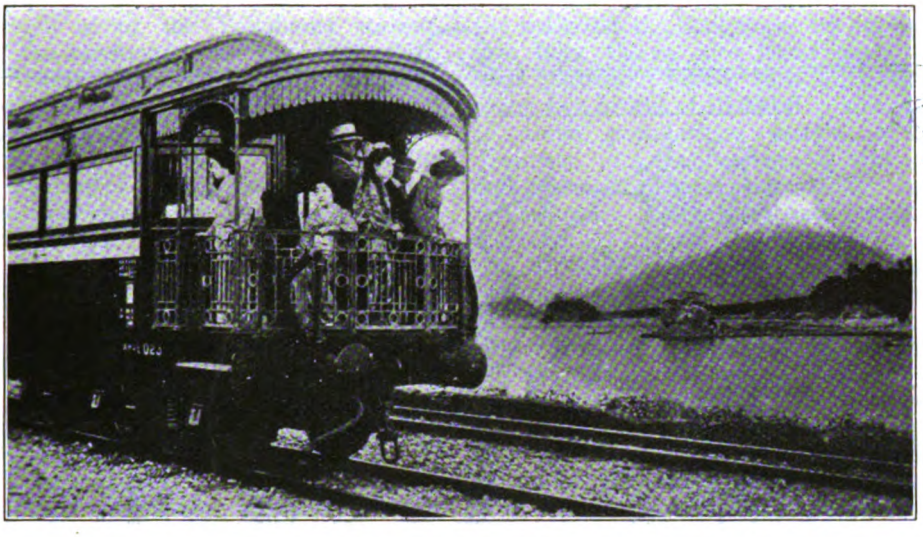

OBSERVATION CAR, TOKYO-SHIMONOSEKI TRAIN-DE-LUXE.

The Imperial Government Railways of Japan.

By R. W. A. SALTER.

[In placing this article before our readers, it is necessary to point out that many of the stations, bridges, tunnels, etc., referred to by the Author have been destroyed or severely damaged as a result of the terrible earthquake which occurred on September 1, or by the resulting fire and tidal wave. The article is, however, presented as prepared for press, but in doing so we invite the sympathetic interest of our readers, and their substantial support of the Lord Mayor of London's Relief Fund, and of the Distress Relief Fund opened in London jointly by the Japan Society and the Nihonjin-kwai (Japanese Association). Donations to the latter will be welcomed either by the Hon. Treasurer of the Japan Society, 22, Russell Square, W.C.1, or by the Hon. Treasurer of the Nihonjin-kwai, 3, Cavendish Square, W.1.—Ed. *R.M.*]

SEVENTY years ago Japan was entirely off the beaten tracks of the world, unopen even to foreign intercourse, but is recognised to-day as a first-class power. Much of her phenomenal success is attributable to the development of an efficient means of internal communication. The first railway was projected by the Government in 1869 with the aim of linking the important cities of Tokyo and Kyoto. But the State Treasury could not afford the outlay, and as private Japanese capital withheld initiative action, it rested with Mr. H. N. Lay, an Englishman, to make advances. His terms accepted, a loan for £1,000,000 was placed on the English market, and a year later, with the arrival of British engineers, work began on the 18-mile line between Tokyo and Yokohama.

The ceremonial opening took place on September 12, 1872, a day which may be reckoned among the most epoch-making in the long history of Japan. According to an eyewitness with whom the writer recently had the privilege of conversing, the Emperor Meiji—appearing for the first time in State robes before the eyes of a public which included foreigners—rode on the first train from Shinagawa (Tokyo) to Yokohama, and there mounted a raised platform to receive congratulatory addresses from a foreign committee headed by the British Minister. Several thousand people in holiday attire

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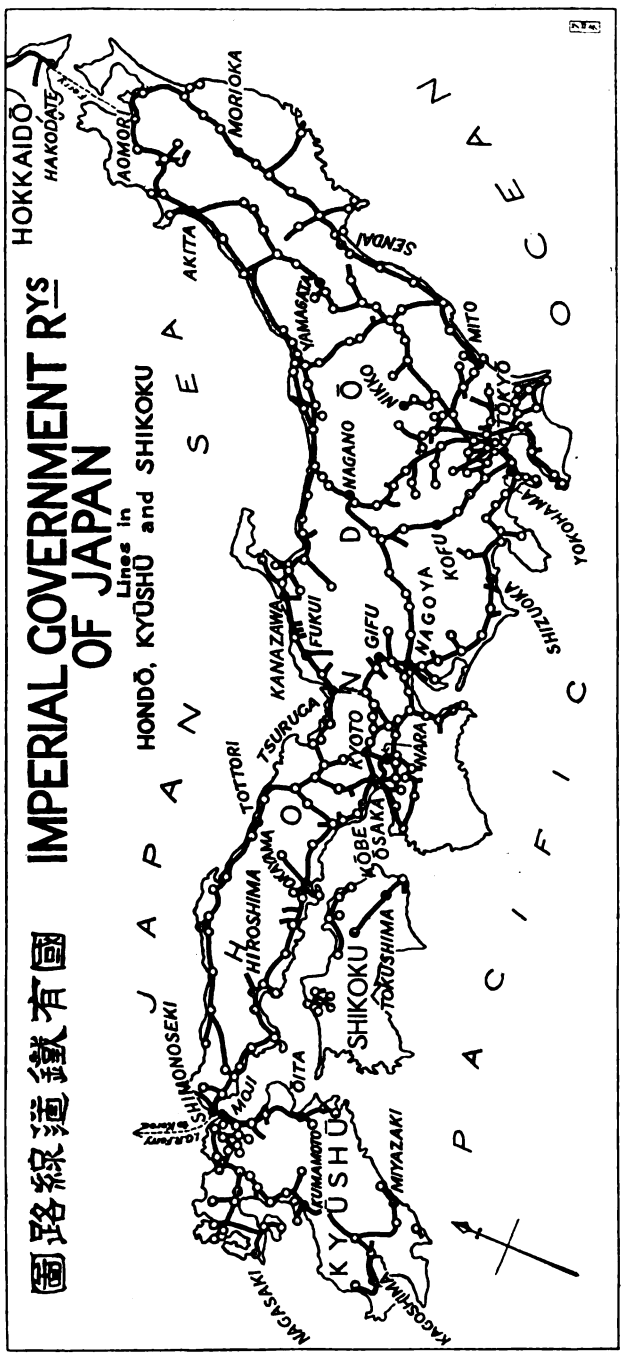

SKETCH MAP SHOWING PRINCIPAL RAILWAYS IN JAPAN.

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thronged about the Yokohama station, and, the ceremony over, the chair which had been occupied by His Imperial Majesty's person was mobbed, kissed and torn in fragments.

The next few years witnessed the construction of other railways. A line was opened between Kobe and Osaka in 1874, and three years later connection was established between the latter city and Kyoto, the present trunk line known as the Tokaido line—closely following the great Tokaido highway, which skirts the Pacific for over three hundred miles, and has witnessed the procession of many a daimyo and his retinue—thus developing gradually from both ends until, in 1889, it was fully ready for traffic.

Though both Government and private companies made constant progress, the former at the outset took the lead. In 1887 the Private Railway Act was passed and imparted a great impetus. But in 1899, when there were more than thirty private companies controlling railways in Japan, it became apparent that diversity of ownership occasioned lack of systematic working, and the question of nationalisation began to be considered. After years of investigation, combined with a careful study of State management in foreign countries, particularly in Germany, the Railway Nationalisation Law was enacted in 1906, whereby during that year and 1907 the Government purchased seventeen leading companies. Instrumental in increasing the mileage of Government-owned railways to 4,371 miles—almost three times what it had formerly been—this law, also, happily assisted the further growth of the railway system, with the result that now many remote districts have railway facilities. The total mileage of railways in Japan to-day is about 7,900 miles, of which some 6,200 are owned by the Government, the remainder by private companies.

In respect of area and population the cluster of beautiful islands which comprise Japan resemble the British Isles, but the topography of the former is considerably more varied, and their remarkable physical configuration gives them a number of distinct climates ranging from sub-arctic to sub-tropical. The mountains which stud Japan throughout her length cover seven-eighths of the entire country: from the sea coast the land slopes up gradually into hills, thence into lesser peaks and high plateaux, finally into lofty ridges rising to a height of 10,000 ft.; and owing to these peculiarities certain of the Japanese lines involve notable and difficult tasks of railway construction.

The means of transport once furnished, the task of proper maintenance in the face of Nature's forces calls for equal skill, ingenuity and patience. The contest with Nature is arduous and costly, and the Administration's exchequer suffers annually to the extent of millions of yen through the devastating effects of avalanches, floods, typhoons, volcanic eruptions and tidal waves. Contingencies occasioned thereby are dealt with, however, with commendable consideration for the well-being of passengers. When encountering a washout on the Joban line not long ago, the writer was filled with astonishment and admiration for the perfect order sustained. The train slowed up gradually; each passenger was handed a check in exchange for his luggage; chairs sprang up from seemingly nowhere; and it was soon possible to resume the journey by another train, with luggage intact, very little delay and annoyance having been caused.

In normal circumstances trains run with the accuracy and trustworthiness of those in our own country, and to this the writer, who recently, at the invitation of the Railway Department, travelled many thousands of miles over the railways of Japan, is well able to testify. Much care is exercised to ensure the regularity of passenger trains, and perhaps there is no other country where, as in Japan, the traveller is entitled to remission of his fare, or free return to his station of departure, should his train fail to connect at a junction owing to delay en route. According to reports of the Administration, accidents through negligence are rare. The whole double trackage is protected by block signals, and less than five per cent. of the total trackage is worked on the staff system.

As originally laid, the railways were exclusively single track. In 1881 a second pair of rails was added to the Tokaido line between Tokyo and Yokohama. Later the remaining portions of that line were double-tracked, and certain sections of

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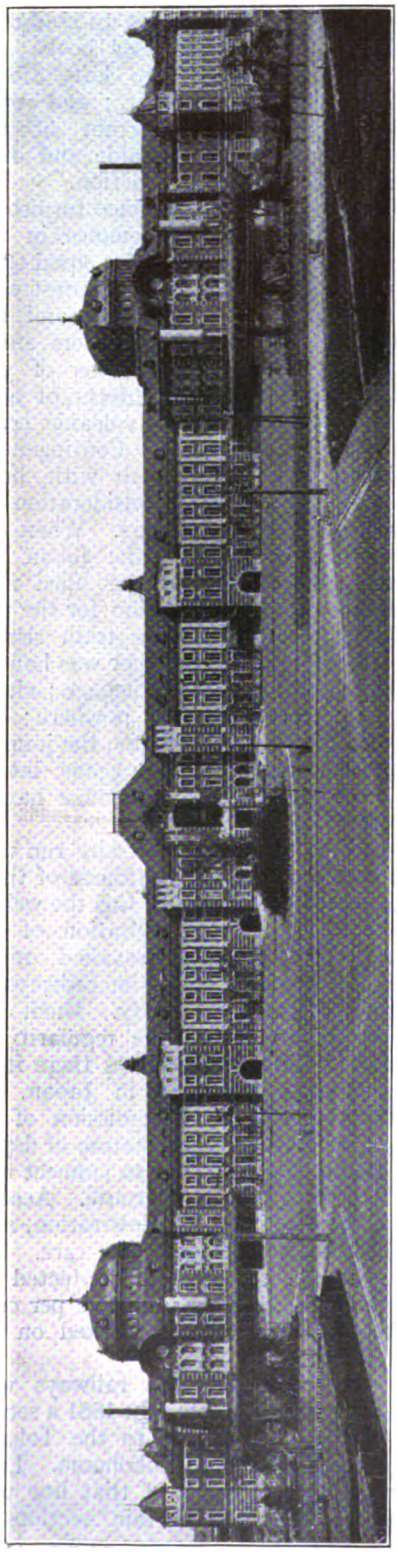

CENTRAL STATION, TOKYO, IMPERIAL GOVERNMENT RAILWAYS OF JAPAN.

other lines have also been duplicated. The gauge adopted for the first railway was 3 ft. 6 in., which is now the general standard. Despite this drawback of narrowness of gauge, the Administration has effected various innovations to secure speed, comfort and safety in passenger services. In point of speed, it must be admitted, the Japanese railways fall below those usual on standard gauge lines traversing level country, the fastest service being between Tokyo and Yokohama, where 18 miles are covered in 28 minutes. The average speeds in miles per hour of passenger, mixed and goods trains are, respectively, on heavily graded sections, 15 to 20, 10 to 15 and 9 to 11, and, on level sections, 25 to 30, 20 to 25 and 15 to 20.

To the writer's knowledge there is no other country in the world where there can be seen from the carriage windows during a few hours' journey scenes of startling grandeur so vividly contrasted with those of infinite beauty. Lack of space precludes any attempt to expatiate upon the scenic wonders that so richly abound on every line, whilst to select for description one section of the system in preference to another would be well-nigh impossible.

Tokyo, the capital of the Empire, is, as one might expect, the converging point for several important lines, and here we meet the largest and finest railway station in the Far East—built 1908-14—whose imposing main building, in the style of the French Renaissance, is sadly out of keeping with the ancient Yedo Castle which faces it across the moat. It is from this station that the Tokaido line, the nucleus of Japan's present far-reaching railway system, loops round to Yokohama, and, after skirting the sacred Mount Fuji, proceeds in a south-westerly direction *via* Nagoya, the eighth century capital, and Kyoto, also a former capital, to the important seaport of Kobe, whence it continues as the Sanyo line, past Osaka (Japan's Manchester) and along the exquisite shores of the Inland Sea, to Shimonoseki, which is connected by ferry with Kyushu, the coal-producing island. The Tokyo terminus of the Joban and Tohoku main lines, placing the capital in communication with the extreme north of Japan, is Ueno, inadequate, poorly devised and unworthy of the city in which it stands. To avoid 20 miles' journey by a slow train (the distance as the crow flies

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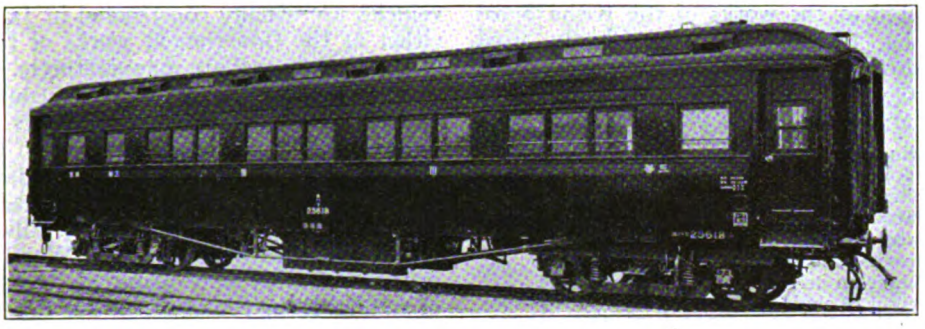
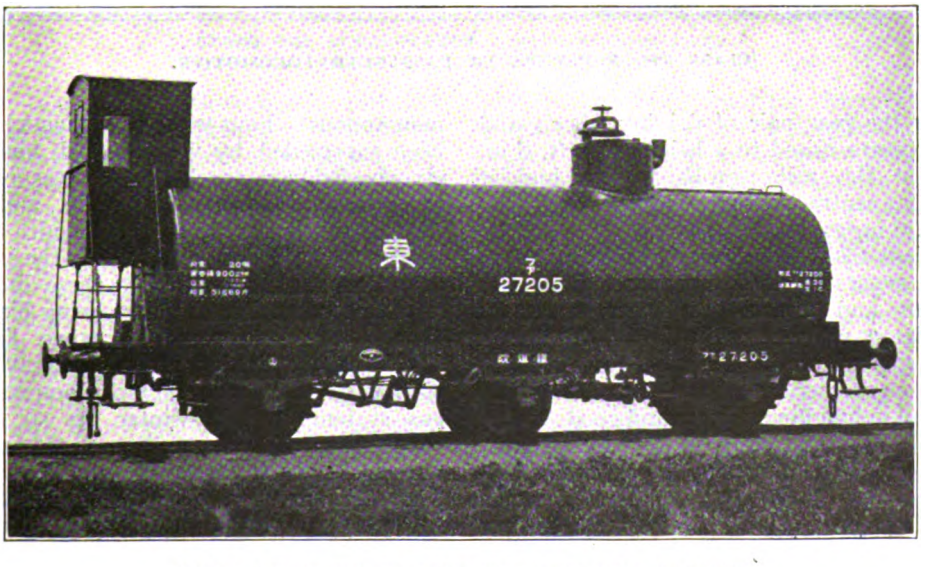


TYPICAL MAIN LINE "BOGIE" CARRIAGE.

is less than two miles) the traveller passing through Tokyo en route from south to north or vice versa must seek taxi or jinrikisha to carry him between the central station and Ueno.

With regard to locomotive practice, it is interesting to note that since Government acquisition of private railways a marked tendency has been the general adoption of heavier and more powerful engines. The first step in this direction was the introduction during 1910 of a powerful class of 4-4-0 passenger engine, followed by the importation of 4-6-0 passenger engines from England, and a number of superheater 4-6-0 and Pacific type locomotives from America and Germany. The superior efficiency and economic value of the superheater was realised after a brief period of operation, and since 1914 all locomotives have been similarly adapted. Among several other types taken up in recent years is the 0-10-0 goods engine for mountain service. A limited number of Mallet compound 0-6-6-0 locomotives from the United States were assigned to lines with steep gradients, but the heavy cost of their maintenance has been found to be incommensurable with the benefits derived from a greater hauling power.

The three classes of engine designated 9600, 6760 and 8620 are adjudged highly suitable for all-round traffic conditions, and the present policy of the Administration is to construct practically all new engines to their standards. Class 9600 engines, the largest and most powerful locomotives built in Japan, were con-



20-TON OIL TANK WAGON, WITH GUARD'S CABOOSE.

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structed at the works of the Kisha Seizo Kaisha, Osaka. They are chiefly used for slow goods trains and passenger trains on steeply graded sections. Leading particulars are as follows :—

Cylinders	20 in. × 24 in.
Coupled wheels	4 ft. 1 in. diam.
Boiler pressure	180 lb. per sq. in.
Grate area	25 sq. ft.
Water heating surface ..	1,376 sq. ft.
Superheating surface ..	363 sq. ft.
Weight on drivers	51·90 tons
Weight of engine in working order	59·40 tons
Weight of tender, loaded ..	30·03 tons

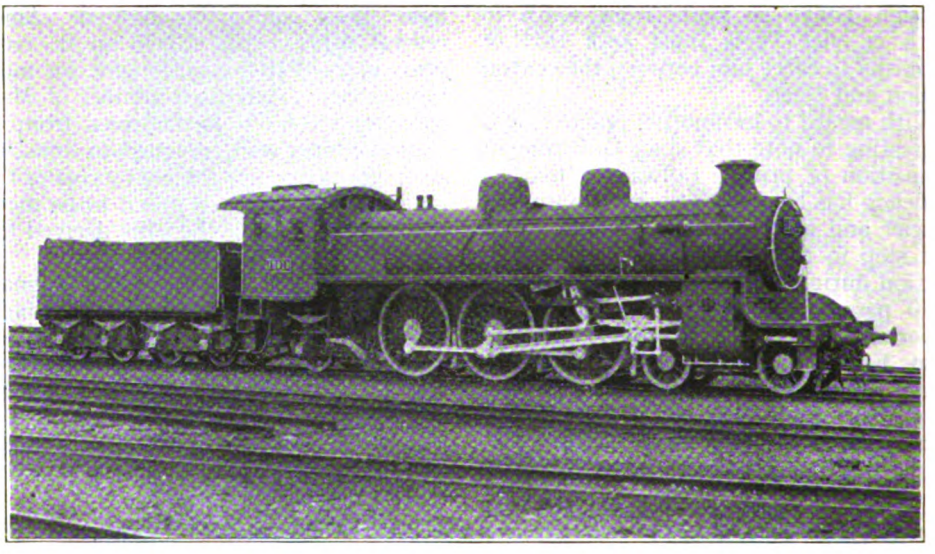
In these locomotives the firebox is placed over the rear pair of driving wheels and the centre raised to a height of 8 ft. 6 in. above the rails, probably the highest boiler centre among engines built for 3 ft. 6 in. gauge railways.

Class 6760 American type locomotives are generally used for local passenger trains and express passenger trains of moderate weight ; while Class 8620 (2-6-0), though originally designed for ordinary passenger services, are found equally useful in handling express and goods trains.

Of approximately 3,122 locomotives owned by the Imperial Government Railways, 983 are the product of Japanese workshops. Great Britain built 28 per cent. of the remainder, and the United States 31 per cent. Passenger and goods vehicles are usually constructed in Japan, either at the Government works or those of the leading private manufacturers.

After journeys in almost every country east of Suez where there are railways, the writer remains firm in his conviction that the highest standard of accommodation in passenger rolling-stock has been reached and is consistently maintained by railways under Japanese management. When the private railways were acquired, the task of standardising rolling-stock was taken in hand and has been pursued so assiduously that the general uniformity in design and appearance tends to become somewhat monotonous. Four-wheeled carriages have been superseded by vehicles with four or six-wheeled bogie trucks, which measure, in the case of the former, 55 ft. 6 in., and, in that of the latter, 66 ft. The width and height of carriages are practically the same as in British railway practice, these dimensions in proportion to gauge being higher than obtain on standard gauge lines. Carriages are lighted almost entirely by electricity or by the Pintsch compressed gas system, and in winter are so thoroughly heated by steampipes placed under the floors as to astonish one how the Japanese traveller, accustomed at home to nothing more than a brazier of burning charcoal, can survive his journeys.

Apart from Imperial carriages, numbering



CLASS 8900 SUPERHEATER PASSENGER LOCOMOTIVE.

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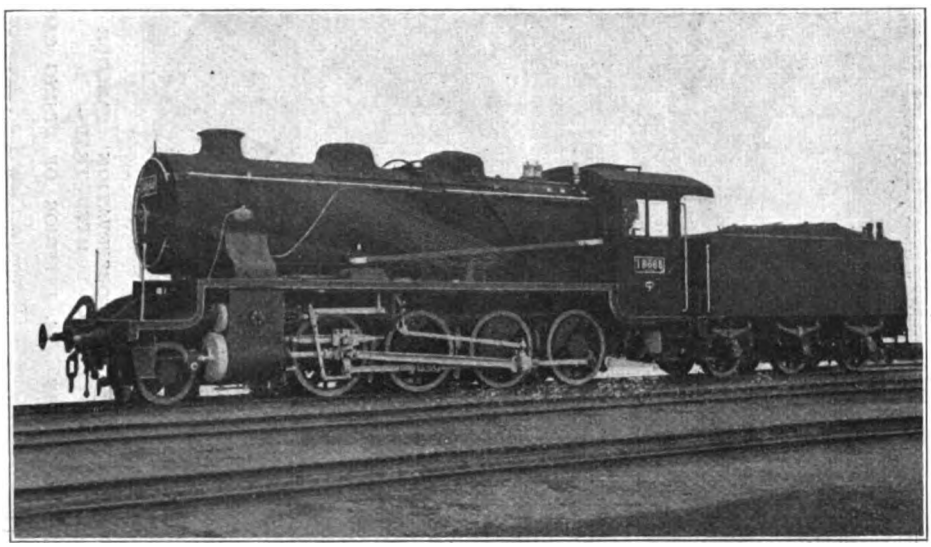
eight, the vehicles of which the Tokyo-Shimonoseki Limited *train-de-luxe* is composed represent the best standard. This train, run daily in both directions, covering the distance of 705 miles in 25 hours 8 minutes (average speed 20 miles an hour on gradients and 34 miles an hour on level stretches) is chiefly for passengers travelling through to China *via* Korea and Manchuria. The equipment consists, in addition to ordinary day coaches, of first and second-class sleeping cars, a dining car and observation car.

When it is remembered that probably less than one per cent. of persons travelling



CLASS 9600 SUPERHEATER GOODS LOCOMOTIVE.

each year by the Government railways are of other than Japanese nationality, English-speaking visitors may congratulate themselves upon the painstaking manner in which the language question has been solved for them. Not merely are time-tables in clear, readable English displayed in the booking halls, and station names and other indications almost invariably shown in that tongue as well as Japanese, but there is on duty in each express train, besides the train boy—a functionary who performs many useful little services, such as handing the passenger his luggage off the rack, dusting his hat, &c.—a *chef de train*, distinguished by a blue armlet, who speaks fluent English and offers information or assistance willingly and without thought of reward. Although it will be seen from the accompanying illustration that the general design of passenger coaches typifies American practice, probably the British visitor at first will feel more at home, for the arrangement of station premises and the method of issuing, examining and collecting tickets is that of England, and the well-ballasted roadbeds are comparable to those of the same country.

Sleeping and dining cars, which, as already remarked, form part of the Tokyo-Shimonoseki Limited train, are also attached to other trains denoted in the time-table as "express," and for the privilege of travelling by which a supplement is payable. The sleeping cars (save some on the *train-de-luxe*) are of the American type, with upper berths lowered from the ceiling and lower berths formed of the day seats, while, to afford some measure of privacy, curtains are drawn in front of them. But for three things—the shortness of the berths, the undimmed light, and the midnight conversations of insomniacs (which among Japanese travellers seem to number legion)—one might repose in peace.

Dining cars in which European meals are served are of the customary arrangement, but as the catering is undertaken contractually by hotels and restaurants—who in most cases also maintain admirable

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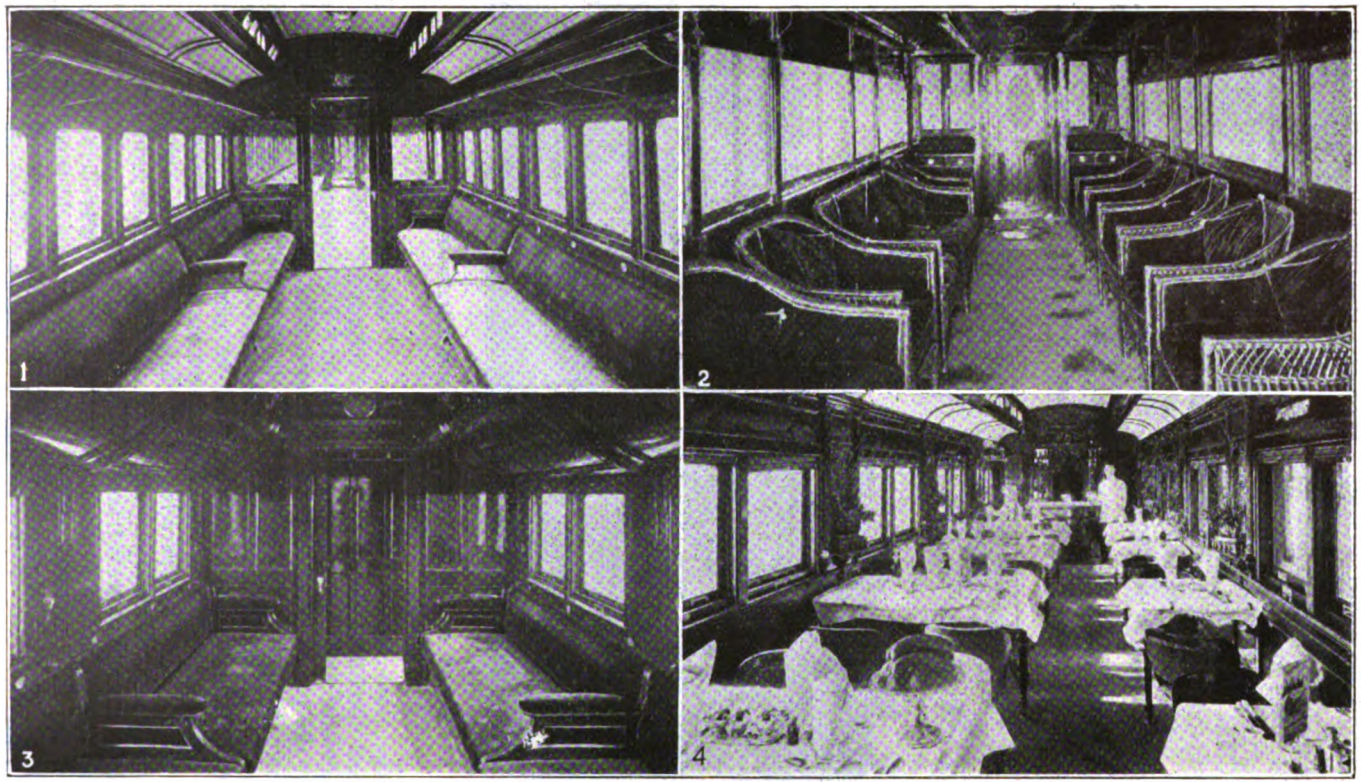

1.—SALOON CAR (NUMBERED SEATS), TOKYO-SHIMONOSEKI LIMITED TRAIN.

2.—OBSERVATION PARLOUR CAR, TOKYO - SHIMONOSEKI LIMITED TRAIN.

3.—FIRST-CLASS SLEEPING CAR, AS ARRANGED FOR DAY TRAVEL.

4.—INTERIOR OF DINING CAR, TOKAIDO LINE.

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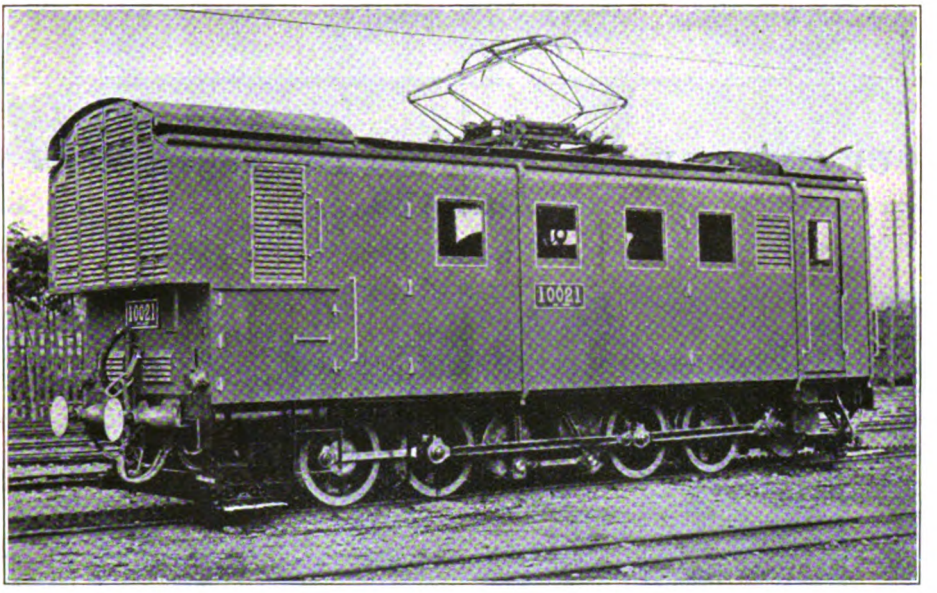
station buffets—the traveller experiences variations in quality, quantity and price of food served. The average charges for European-style *table d'hote* meals are, converted to English equivalents, 2*s.* for breakfast, 3*s.* for luncheon, and 4*s.* 6*d.* for dinner. For those who study economy rather than the welfare of their digestive organs it will be found advantageous to take a Japanese meal (about 1*s.* 6*d.*) which generally consists of fish soup, boiled rice, cooked or raw fish, pickled radish, and assorted rolled seaweed. The kind of meal latterly described is served on a clothless polished wooden shelf fixed to the side of the car, so that the diner, seated on a revolving wooden stool, has an uninterrupted view from the window of the passing scenery. Mention might also be made of the *bento* (boxes of cooked rice and vegetables, complete with chop-sticks and paper napkin) and other delicacies hawked on station platforms.

For many centuries Japan's agricultural capacity has been developed to the utmost, but with the advent of railways a new and important factor entered into the national life, and Japan became a great industrial power. It is not surprising, therefore, that goods traffic yields a larger return than passenger, although this was far from the case in the early days of the country's railway history. The writer had another object than that of investigating goods train working, but his frequent journeys through the great industrial areas, which pulsate with activity as do Manchester or Middlesbrough, coupled with brief visits to the extensive goods yard in Osaka and Moji, gained for him the general impression that the Administration has sought to copy—and not without success—the best methods of Europe and America. While goods wagons of 8 to 10 tons capacity preponderate, those of 11 to 15 tons make a close second, and there is a large percentage of 21 to 30 ton wagons.



CLASS 10020 ELECTRIC RACK AND ADHESION LOCOMOTIVE (USUI PASS).

The question of electrification, though by no means the least important, comes finally to our attention. Rapid strides are being made. The electric overhead railway in Tokyo provides a creditable example of modern urban transportation, and, being of later conception than the Liverpool Overhead and New York Elevated railways, compares favourably with those systems. Besides this, an electric line, with trains running on a 12-minute headway, connects the capital with its seaport, and is much patronised by residents of the Settlement whose daily vocation leads them to Tokyo. The other completed electrification scheme which

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calls for notice is the 7-mile section in the Usui Pass (Tokyo-Nagano line), for which the Abt system was adopted. The gradient is 1 in 15 for a matter of five miles, and there are no less than 26 tunnels, in view of which electric traction has proved immensely beneficial, to the extent of making the journey, formerly an ordeal, into one of the pleasantest experiences, for the region traversed is eminently romantic and beautiful.

In conclusion the writer would like to record his opinion—one which he believes is shared by most Occidental visitors—that there is a future coloured with yet greater achievements in store for the Imperial Government Railways of Japan. The Japanese themselves possess confidence in their ability to promote higher standards, but at the same time they do not forget to pay tribute to the assistance lent by Great Britain in the early days of the country's railway history.

In connection with the preparation of this article special thanks are due to Mr. U. Beppu, Director of the Financial and Purchasing Bureau, Tokyo, who supplied the excellent illustrations, and afforded the writer access to the statistical records of the Administration.

UP-COUNTRY ON THE SOUTH AUSTRALIAN RAILWAYS.

ONE of several photographs kindly forwarded by Mr. E. H. Potts, of Coonalpyn, South Australia, is reproduced above. This shows an RX class 4–6–0 locomotive, No. 226, at Mount Banker Junction. This station is the junction between the Victor Harbour and Erinaton lines. The engine has coupled wheels 5 ft. diameter, and is of a class used extensively for working heavy goods trains, and, to some extent, passenger trains also, in the Mount Lofty range, where there are gradients as steep as 1 in 45.

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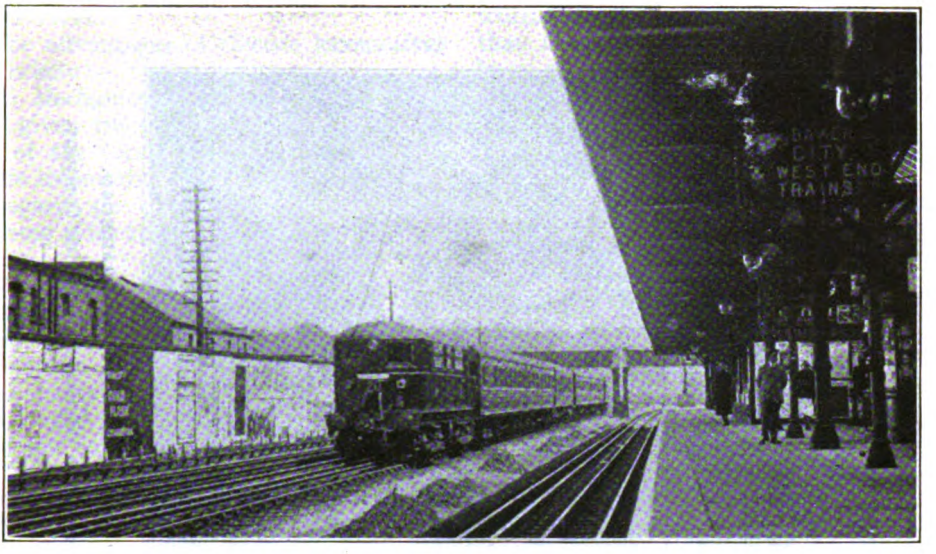

Photo.] METROPOLITAN RAILWAY. [*J. F. Gairns.*

Pullman Car Express passing West Hampstead at 40 m.p.h. Rebuilt electric locomotive No. 20.

Electric Locomotives.

By S. J. McCANN.

THE electric locomotive is no longer an experiment in its application to steam railroad operating conditions. Its first introduction into the highly developed sphere of steam railroading was to some extent compulsory, with the object of overcoming the smoke nuisance of the steam locomotive, and for developing traffic facilities to a degree not possible with steam operation. Its application has, however, proved conclusively, that for reliability of operation, economy of maintenance, flexibility of control and availability for service, it is superior in many ways to the steam locomotive. In development it has kept pace with the recent rapid advance of the steam locomotive, until to-day single locomotives are built with axle loads of 65,000 lb. and a continuous rating of 4,000 h.p. The electric locomotive has won its spurs in every class of steam railroad operations, including tunnel, main line, heavy grade, freight and shunting operations. At present there are about 1,200 electric locomotives in service on the railways of the world.

For suburban passenger service, electric locomotives are not so suitable as the motor-car type. In this class of service, the energy consumption is considerably influenced by the acceleration, retardation, and the weight of the train, while in main line passenger and freight traffic these items have only a slight influence. Therefore for suburban service the trains must be of relatively light weight, with the non-passenger carrying portion restricted to a minimum.

These conditions are satisfied by excluding the locomotive from the train and equipping the coaches with motors, so that the whole or a portion of the weight of the passengers and rolling-stock is utilised for adhesion. On the other hand, the requirements of long-distance main line passenger and freight traffic involve the running of various types of rolling-stock, such as restaurant cars, sleeping saloons, corridor coaches, wagons, etc. Under these

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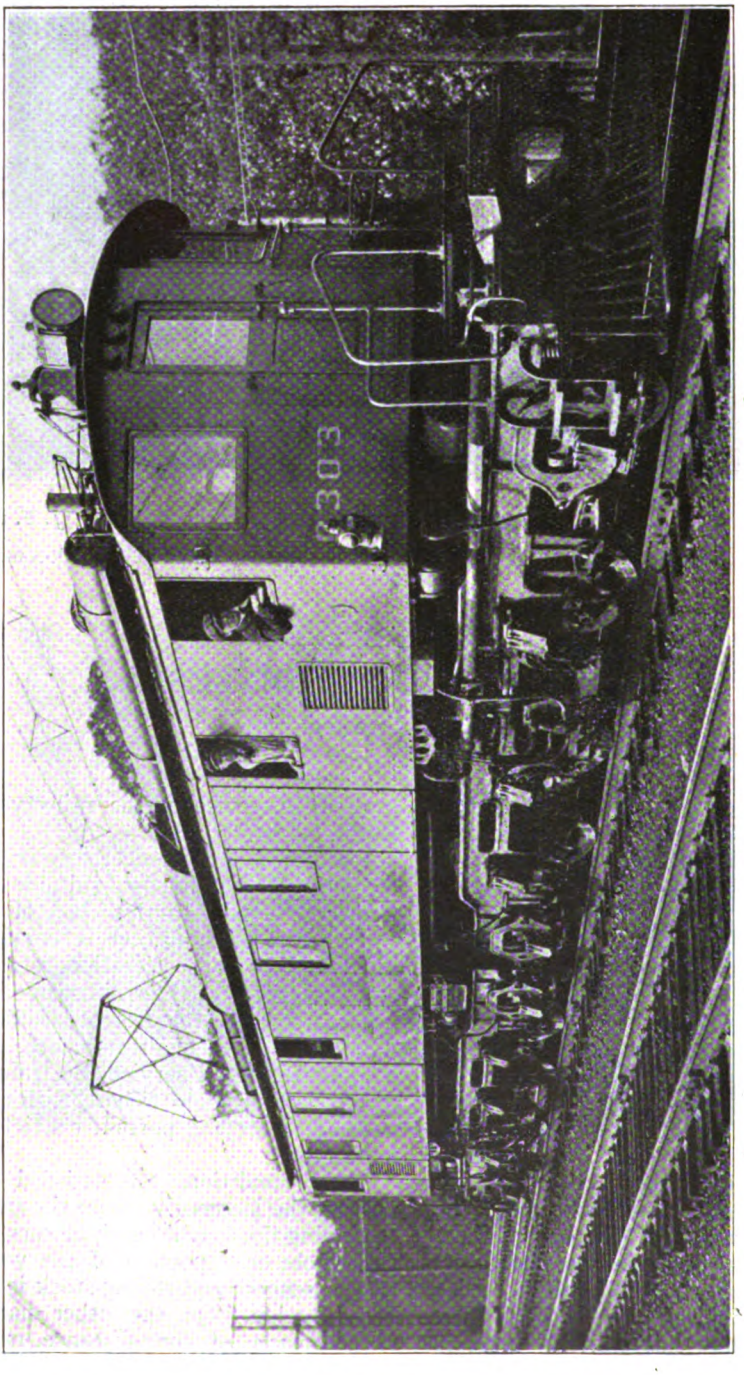

NEW ELECTRIC PASSENGER LOCOMOTIVES FOR THE NEW YORK, NEW HAVEN & HARTFORD RAILROAD.
One of twelve 180-ton locomotives constructed by the Baldwin Locomotive Works and the Westinghouse Electric Company.

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conditions they must be handled by locomotives.

The advantages of electric locomotives are briefly :—

(1) Mechanical efficiency is constant for any given tractive effort throughout the life of the locomotive, whilst that of a steam locomotive diminishes, particularly as regards the boiler, in progressively increasing ratio to the time it is out of the works.

(2) The coal and water has to be carried, in addition to the weight of the tender ; these on an average represent 40 tons per locomotive. The electric on this score alone has an increased hauling power of four loaded five-ton wagons or two passenger bogie coaches per train.

(3) Mechanical efficiency greater.

(4) No stand-by losses.

(5) No turntable operations required.

(6) Tractive effort is more even, the gain in adhesion being in the order of about 20 per cent. Also the steady increase in drawbar pull during acceleration minimises the risk of coupling breakages.

(7) Service capacity increased in cold weather.

(8) Convenience of operation.

(9) Maintenance costs considerably less.

(10) Diversity of service.

(11) Double heading possible with only one train crew.

(12) Regenerative braking possible.

(13) Constant availability for service.

(14) Can exert maximum tractive effort of a steam locomotive at considerably higher speeds.

(15) Cleanliness.

The disadvantages are :—

(1) Failure of current supply causes hold up of all trains.

(2) Obstruction caused by trolley wire or conductor rails (especially in goods yards).

(3) Heating of existing passenger stock.

(4) Higher first cost.

Features which Govern Design.

(1) Loading and construction gauges of railways. These have not introduced any serious difficulties with electric locomotives.

(2) Maximum concentrated weight permissible to be carried by the permanent way. This depends on the strength of the permanent way and is limited to about 20 tons, whilst the strength of bridges will not allow this load to be carried on more than three axles having an overall wheelbase of 14 ft. This corresponds to a modern 4-6-0 steam locomotive with an adhesion weight of 60 tons.

(3) Strength of drawbar or coupling gear on existing stock.

(4) Tractive effort or drawbar pull required. This depends on weight of train, acceleration and gradients.

(5) Speed required. Depends on the class of service and schedule required.

(6) Service requirements, *i.e.*, passenger, max. speed, 70 ; freight, max. speed, 45 ; shunting, max. speed, 20.

Locomotives for passenger and freight service differ from one another only in details when it is necessary to meet the service operating conditions, such as changing the gear ratio and providing heating and lighting equipment. It is also important to reduce the weight of the locomotive to a minimum consistent with requirements for tractive purposes, in order to reduce the tonnage movement and therefore power requirements to a minimum. This makes it desirable, in considering locomotives for purely freight services, to design them with all the weight on the drivers.

(7) Wheel arrangements : Influence of wheel arrangement on track wear and maintenance, the height of the centre of gravity and the disposition of the various parts of a locomotive is a large and controversial subject. The chief trouble with the track is the spreading of the rails, due to excessive lateral pressure from the wheel flanges. This lateral pressure is produced by the transverse movement of the locomotive between the track rails (termed " nosing "). From tests this pressure is found to be greatest with the gearless type locomotive, the geared comes next, with the side-road least, and it is only beaten by the steam locomotive. One of the most important problems in the design of high-speed locomotives is to limit these lateral oscillations, which tend to distort the track.

There are three general methods of transmitting power from the motors to driving wheels :—

1. *Gearless*, in which the motors are mounted direct on the axles, and this class can be divided into two—

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(*a*) Direct, where the armatures are pressed direct on the axles.

(*b*) The armature may be fixed to a hollow sleeve or quill, which surrounds the axle, with sufficient clearance allowed for vertical play, the torque being transmitted to the driving wheels through springs.

Limitations of this design.—When the armature is mounted directly upon the axle, the full distance between the wheel flanges can be utilised for electrical purposes by adopting a two-pole design, with flat pole faces to allow for vertical play. With a multipolar design or flexible drive, the bearings for the frame will require 25 per cent. of this distance. Hence a two-pole motor will allow of the use of smaller driving wheels than a multipolar machine, thereby leading to a more economical design on account of the higher armature speeds.

There are limits to the maximum size of a motor that can be carried directly upon an axle. First, the low centre of gravity will probably result in bad riding qualities, and, secondly, a large dead weight on the axles will lead to increased track wear. These considerations appear to limit the size of this type to about 500 h.p.

2. *Geared*, in which the motors are geared to the axles. This class can be divided into two :—

(*a*) Rigid, where the motor is supported on the truck frame and the axle.

(*b*) Flexible, where the gear is mounted on a quill and drives the wheel through springs. Developed especially for single-phase motors, to overcome the vibration, due to the pulsating torque.

The size of motor mounted in the usual manner is limited by the diameter of the driving wheels and the track gauge. With standard track, 4 ft. 8½ in. and 48 in. wheels, a d.c. motor of 300 h.p. can be accommodated, and with 60 in. wheels a motor of 500 h.p. could be accommodated. Another limiting factor is the peripheral speed of the gears, which at the maximum speed of the locomotive should not exceed 2,500 to 3,000 ft. per minute for spur gear with straight teeth, but with helical gearing this can be increased to 4,500 ft. per minute.

Another factor is the limiting peripheral speed of the armature, and should not exceed 7,500 ft. per minute.

When the size of the driving wheels and the maximum speed of the locomotive are fixed by assuming an appropriate value for the limiting gear velocity, the maximum diameter of the pitch circle of the gear which can be obtained. This diameter, however, must provide sufficient clearance between the bottom of the gear-case and the track, and this is generally the limiting feature in slow and moderate speed locomotives.

(3) *Side-rod*, in which the motors are coupled to the driving wheels by side connecting rods. This method has received the greatest development on the Continent. The object of this design is to enable one or two large motors to be used instead of a number of smaller ones. The motors are located in the cab and drive the wheels by means of cranks and side-rods, a suitable number of wheels being coupled together to obtain the adhesion required. In this manner a high centre of gravity is secured and the axles relieved of heavy non-spring-borne weight. When a number of axles are driven by coupling rods it is essential that the former should remain substantially parallel. To enable the locomotive to negotiate curves, the outer axles must be allowed considerable end play, 1 in. to 1½ in., depending on the wheelbase and the curvature of the track.

Speed is limited by the permissible angular velocity of crankshafts and the limiting peripheral speed of the armature. For speeds over 50 m.p.h. an economical design can be evolved taking into consideration the above, but under 50 m.p.h. it is necessary to adopt gearing between the armature and jack shaft to obtain an economical design.

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Photo.] [*J. F. Gairns.*

CANTERBURY TRAIN AT THE PRESENT WHITSTABLE HARBOUR STATION.

The old station is on Harbour premises, on the other side of the main road, beyond the level crossing protected by the signal cabin behind the train.

0–6–0 tank engine No. 147.

The Canterbury and Whitsable Railway of To-Day.

By H. L. HOPWOOD.

OPENED on May 3, 1830, the Canterbury and Whitstable Railway ranks as the second "public" railway of England, and in this respect takes precedence of the larger and better-known Liverpool and Manchester Railway. An account of the early history of the Canterbury and Whitstable Railway, which appeared in the RAILWAY MAGAZINE for October and November, 1907, took the reader to the year 1846, when the line was leased to the South Eastern Railway; the present article is designed as a continuation of the former one, and deals more particularly with the railway as it is to-day.

The outstanding features of the Whitstable Harbour branch are the tunnel at Tyler Hill and the exceedingly severe gradients encountered en route. The line as originally proposed by John Dixon (George Stephenson's assistant) was to run through Blean, have no heavy earthworks, and be practically level throughout; but such a state of affairs did not accord with the ideas of some of the promoters, who required the novelty of a tunnel. A tunnel was therefore provided, but it meant altering the original survey and taking the line through some undulating country; hence the very steep grades which exist to-day, not to mention the tunnel, which, on account of its diminutive bore, has always restricted the size of engines and rolling-stock passing through it.

In its independent state, the railway was far from being a financial success, and when, in 1844, an Act was passed authorising an extension of the South Eastern Railway from Ashford to Margate, *via* Canterbury, it also included, by arrangement, a 14 years' lease of the Canterbury and Whitstable Railway. The extension from Ashford was completed as far as Canterbury on February 6, 1846, and

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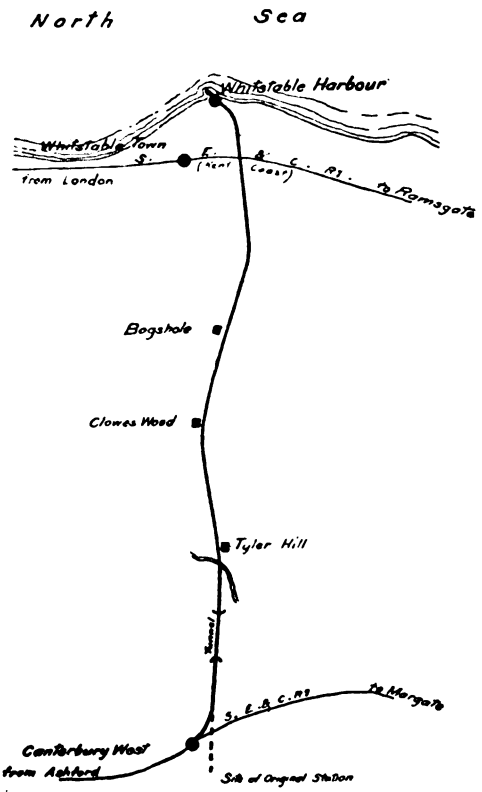

MAP OF THE CANTERBURY AND WHITSTABLE RAILWAY.

The present Whitstable (Town) Station, Kent Coast Line, is adjacent to the point where the Canterbury and Whitstable line crosses. Tankerton Halt platform on the latter is connected with the Town station by footways.

in the same year, as soon as a physical connection between the two systems, together with several alterations, had been effected—the South Eastern Railway commenced to work the smaller line, and finally, in 1853, purchased it outright.

The three original winding engines were dispensed with, and the line was worked throughout by locomotive power. For some time after 1846 the engines used appear to have been four-wheelers of the "Bury" type, of which the South Eastern Railway then possessed a few specimens. They were succeeded by some 0-6-0 tender engines which had been built by Tayleur and Company in 1845-6. Known as the 119 class, they had 15 in. by 24 in. cylinders and 4 ft. 6 in. coupled wheels. These engines ran until 1883, when they were broken up and replaced on this service by two of Mr. James Stirling's standard 0-6-0 tender goods engines, Nos. 297 and 298, which were specially fitted with short chimneys.

Since 1890, the branch has been worked by class R 0-6-0 side tank locomotives, originally designed by Mr. Stirling in 1888. Between that date and 1898, 25 of them were built at Ashford Works, four of which, Nos. 10 and 147 (1890), 124 (1892), and 126 (1898), were fitted with short chimneys. When first built, this class had cylinders 18 in. by 26 in. and six-coupled wheels 5 ft. 1 in. in diameter. Domeless boilers were fitted, and these gave a total heating surface of 935 sq. ft. The total weight was 42½ tons.

Of the four Whitstable branch engines alluded to, Nos. 10 and 147 have been rebuilt with domed boilers by Mr. Maunsell. The new boilers are of the same size as formerly (10 ft. 3½ in. long and 4 ft. 3 in. in diameter), but the total heating surface has been increased to 1100·05 sq. ft., of which 97·6 sq. ft. is provided by the firebox. The working pressure is 160 lb., and the grate area 16·66 sq. ft. The total weight, with 750 gallons of water and 35 cwt. of coal, is now 46¾ tons, and the tractive effort at 80 per cent. of boiler pressure, 17,391 lb. In the process of rebuilding, the side wings have disappeared from the smokebox and the leading sandboxes have been removed from above to below the footplate.

As already mentioned, the small size of Tyler Hill tunnel restricts the height and width of engines and carriages passing through it, and the height from rail level to chimney top is consequently limited to 11 ft. 6 in., or about 18 in. less than that of the average British locomotive. For the same reason, small and antiquated types of South Eastern carriages were employed until recently. The writer last saw the old branch train at Canterbury in June, 1917, but since then it has been replaced by a set of four ex-London, Chatham and Dover close-coupled four-wheeled coaches which have had the eaves of the roofs reduced in order to keep within the loading gauge.

In the former article a gradient profile was included, but it will be as well to repeat particulars here. From Canterbury West the line rises at 1 in 76, 41, 47, 56 and 49 for nearly a mile to the site of

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the old winding engine at Tyler Hill. Half-way along this stretch the tunnel (828 yds. long) is passed through. From Tyler Hill to Clowes Wood summit (where there was another winding engine) the line continues to rise for more than a mile at 1 in 843, and then falls at 1 in 63, 31 and 28 for another mile. Following this, there is a level mile, and, finally, a descent into Whitstable at 1 in 57, 50, 182 and 2020. The maximum load of a goods train working over the branch is 18 wagons.

At Canterbury West, Whitstable trains are accommodated at the back of the down platform. Of this station, it may be remarked that, beyond the lengthening of platforms and the provision of additional bay lines, it has very much the same appearance to-day as when built in 1846. The present station at Whitstable Harbour, opened in 1893, is the third which has done duty at that place since 1830. It has but one platform and is situated on the south side of Harbour Street, at which point there is a level crossing. The station it superseded still stands on the opposite side of the road and is the one erected by the South Eastern Railway when they commenced to work the line in 1846. As already stated, it has been disused since 1893, and the accompanying view, photographed in October, 1922, shows its present condition. The original station of 1830 was adjacent to the "Steam Packet" Inn, but it is doubtful whether it had the orthodox platform; certainly, no trace of one is now to be found.

The branch is a single line without intermediate crossing places, and is worked on the staff and ticket system. For many years there were no roadside stations, but three halts—Blean and Tyler Hill; South Street; and Tankerton—have been built more recently. The last-named halt is adjacent to Whitstable Town station, on the Kent Coast line, and a considerable interchange of passengers occurs, a short footpath connecting the two places.

There are nine trains each way daily—three of them being "mixed"—and one extra up and down on Saturdays. In the summer months there is also a Sunday service of five trains each way, the first one starting from the Cathedral City at 2.0 p.m. Passenger trains occupy 18 minutes and mixed trains 22 minutes on the journey. Second-class accommodation, although standard elsewhere on the South Eastern and Chatham Section, is not provided on the Whitstable branch. The distance from Canterbury West to Whitstable Harbour passenger station is 6 miles 1 chain, but the extension of the line to, and around, the harbour approximates a further 40 chains.

The writer's thanks are tendered to

Photo.] **THE OLD PASSENGER STATION AT WHITSTABLE HARBOUR.** [*H. L. Hopwood.*
Built 1846, disused since 1893.

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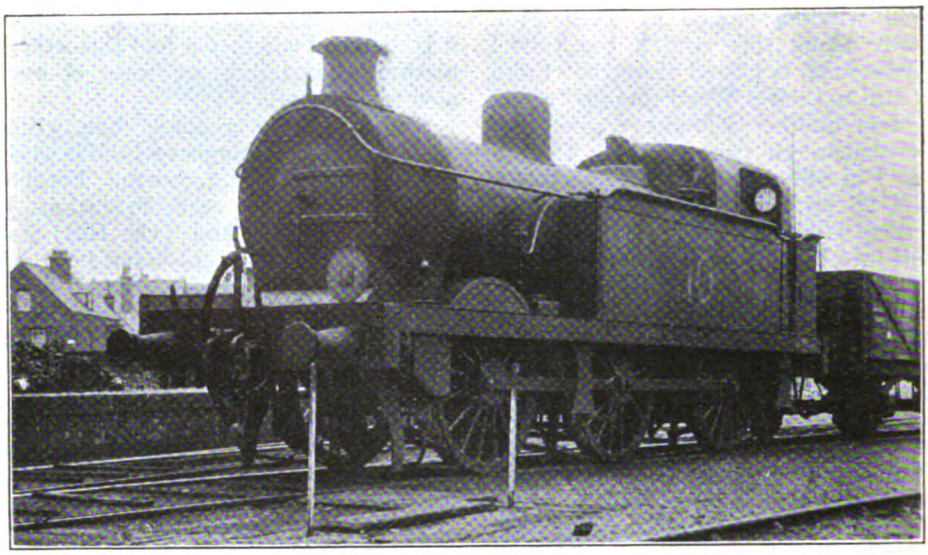

Photo.] REBUILT 0-6-0 TANK ENGINE NO. 10. [*H. L. Hopwood.*

As fitted with short chimney and rounded cab, for working the Canterbury and Whitstable line.

Mr. R. E. L. Maunsell, Chief Mechanical Engineer of the Southern Railway, for kindly furnishing particulars of the locomotives in their rebuilt form.

LOCOMOTIVE AND TRAIN WORKING IN THE LATTER PART OF THE NINETEENTH CENTURY.

⊛ ⊛ ⊛

Under this heading Mr. E. L. Ahrons will deal with the Locomotives and Trains of the

MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY

in the forthcoming RAILWAY MAGAZINE, November, 1923.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN, A.M.Inst.T., A.I.Loco.E.

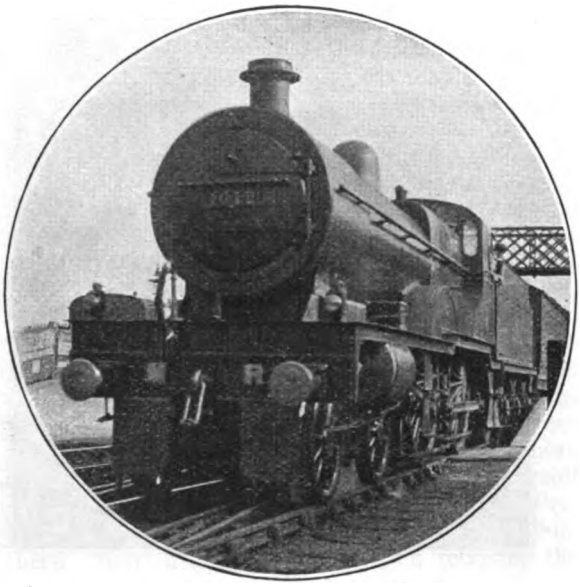

Photo.] [*R. P. Angus-Lewis.*

LONDON MIDLAND AND SCOTTISH RAILWAY.

Midland superheated compound 4-4-0 locomotive, No. 1012, on train leaving Loughborough.

THERE has been proceeding recently in the columns of the *Observer* a correspondence of no small interest relative to "Railway Speeds." It was based in the first instance on a well-informed article in that journal entitled "Railway Speed in 1923," which pointed out the definite resumption of progress in railway speed, held up, and, indeed, seriously set back by the war. The writer gave statistical information to prove that in many directions speeds are now being run superior to those operating before the war, and emphasised the fact that many of the alterations made during the past summer are permanent accelerations of important business services, rather than brilliant but merely temporary expedition of services which are seasonal only. Subsequent correspondence included the usual crop of nonsense concerning the speeds of the past, such as the legend that the "Flying Dutchman" was booked from Bristol to London 45 years ago in 130 min., including a stop at Bath and a ten-minute stop at Swindon (*sic*), with which and other purely apocryphal achievements various correspondents later on dealt faithfully. But the letter which attracted my own attention the most was one from a well-known past contributor to the RAILWAY MAGAZINE strongly advocating the re-introduction of the old-time "single-driver" as a medium of higher railway speeds.

After correcting a correspondent who attributed the famous Great Western racing performance of 1904—when the journey from Pylle Hill Junction at Bristol to Paddington was completed in 99 min. 46 sec., start-to-stop—to a 4-4-0 and not a 4-2-2 engine, whereas one of the latter type (No. 3065, *Duke of Connaught*) was responsible for the feat, the writer of the last-mentioned letter proceeded: "Is it not a fact that the 'Riviera' and other expresses, not only on the G.W.R. but other important lines, when at all heavy, are now generally hauled by two engines, very often both of the six-coupled type? I make bold to say that what is wanted to-day is the re-introduction of the 'single-driver' type, admittedly always the most economical, both in fuel and running repairs, and with great freedom in running, as well as high speed capacity. With driving wheels not less than 8 ft. (or even up to 9 ft. 6 in., which would be about the limit of the loading gauge), adhesion weight at least 20 tons;

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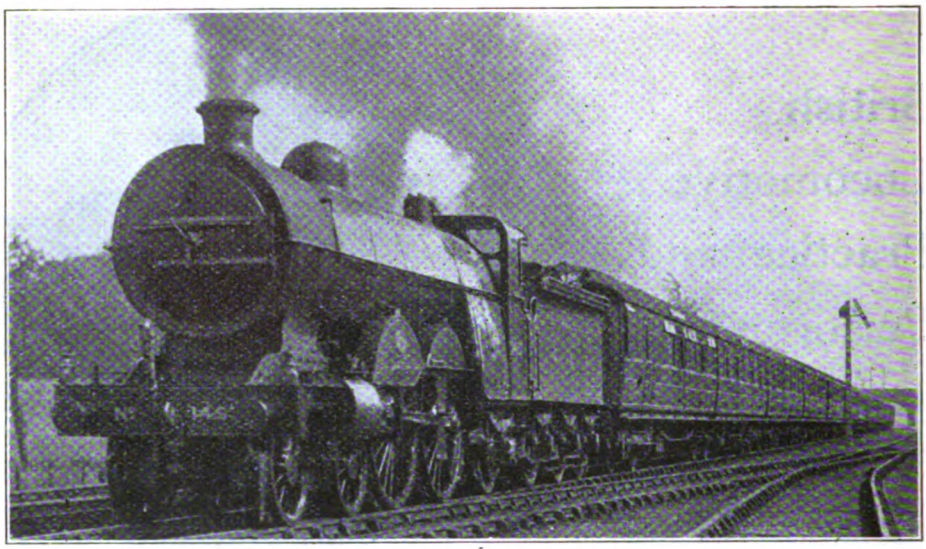

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*F. E. Mackay.*

4 p.m. King's Cross—Leeds and Bradford express passing Hadley Wood.
Great Northern 4-4-2 locomotive, No. 1457.

and the 'Wootten' or wide type of firebox, as used on the Great Northern in the large 'Atlantics' and 'Pacifics,' such engines would be capable of running with the greatest ease and economy :—

"(1) Expresses of from 150 to 200 tons at average speeds of 66 to 75 miles per hour.

"(2) Expresses of from 200 to 300 tons at averages from 56 to 65 miles an hour, and

"(3) Expresses limited to 350 or 400 tons, at speeds varying from 50 to 55 m.p.h. As modern practice, not only on the Great Northern, but also on the Midland and Western sections of the London Midland and Scottish Railway, increasingly demands the employment of two powerful engines on heavy expresses, the use of two single-driving engines on such trains would be most advantageous.

"The modern 4-6-0 or 4-6-2 express engine, with three or four cylinders, is becoming far too complicated and costly an affair to work with reasonable regard to economy. It ought to be possible to produce a much more simple machine with large single 'drivers' 8 or 9 ft. in diameter—the slower piston speed and absence of coupling rods would greatly reduce wear and tear—and with 22 or 23 tons adhesion weight loads running up to 450 tons could be tackled if necessary.

"Another reform that is urgently required is to reduce the deadweight per passenger carried, without at the same time curtailing accommodation and comfort in travelling."

With all respect to the writer, I find myself at issue with him over practically every point in this letter, and the difficulty is that of compressing into a reply of suitable brevity all the arguments to the contrary, so many controversial points having been raised. Furthermore, many personal opinions on exceedingly debateable points are laid down as statements of fact, when the evidence is either inconclusive or very much on the contrary. In the first place, it is claimed that British expresses, when at all heavy, are now hauled generally by two engines, very often both of the six-coupled type, the "Riviera" express of the Great Western Railway being singled out as a case in point. Where the writer can have got such information is a complete mystery. I have never either travelled in or so much as seen a first-class express piloted on the Great Western Railway, save only over such heavy gradients as the ascent from Taunton to Whiteball Summit, or the mountainous grades between Newton Abbot and Plymouth. Occasionally pilots do appear elsewhere on that system, but

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they are generally engines being worked additionally on a train in order to get "home," or for other similar reasons. Pilots have been *tabu* absolutely on the Great Northern line from the days of the Stirling singles until quite recently, except on those rare occasions when a "Pacific" has not been available to work tightly-timed trains weighing round about 500 tons; this summer's accelerations have made their use imperative with trains of over 420 tons or so tare weight, when only an "Atlantic" is available, the pilot in this event being generally a small 4-4-0. Even now, however, G.N. piloting could not be described as anything more than occasional, and pilots are not often seen on the Great Eastern, North Eastern or Great Central sections of the same group, nor on any of the three constitutent portions of the Southern Railway.

It is only on the Western and Midland Divisions of the L.M. & S. group and on the Scottish lines that piloting could be considered as a frequent occurrence. The tremendous gradients of the Scottish lines are in themselves ample excuse for the use of pilot locomotives over their adverse stretches, or bank engines in rear, whenever loads are "at all heavy." On the Midland line, with no larger type than the 4-4-0 in use, comparatively frequent piloting is necessary in order to maintain very sharp sectional times over a steeply-graded road. On the Western Division it has now become the custom to allow a pilot to all the engines for over 400 tons through the summer months, and over 360 tons over the rest of the year, south of Carnforth, with somewhat reduced tonnages between Carnforth and Carlisle. But the latter figures are well below the proved tractive capacity of the engines concerned, and it is difficult to understand the necessity for such drastic load limitations. Even then it is a comparative rarity to see two 4-6-0 engines on the same train, the pilots being more generally 2-4-0 "Jumbos," or the small 4-4-0 "Renowns," or the larger "Precursors" or "Georges." The reintroduction of singles, so far from reducing the negligible amount of piloting that obtains on all lines other than those last-mentioned, must serve greatly to increase it.

Piloting is objectionable on many counts. On the score of economy, it doubles the wages of the engine crews, and though it may not, in the aggregate, double the consumption of fuel and the wear and tear of locomotive stock on a heavy duty, it certainly is considerably more costly than working a more powerful engine unaided on

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*F. E. Mackay.*

12.5 p.m. Up Manchester Restaurant Car Express near Kenton.
L. & N.W. 4-6-0, four-cylinder locomotive, No. 1092, and train composed of Midland 6-coach dining-car set, with additional L. & Y. and L. & N.W. vehicles.

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Photo.] **LONDON MIDLAND AND SCOTTISH RAILWAY.** [*W. Leslie Wood.*

Midland 4-2-2 locomotive, No. 647, at Blackwell.

the same duty. The first engine throws up dust into the motion of the second, especially on lines which cannot afford the expense of finely screening their ballast. It has been with a view to avoiding these and other troubles, as far as reasonably possible, that the various railways have built the large 4-4-2, 4-6-0 and 4-6-2 express locomotive types that now work the bulk of the fastest and heaviest trains.

Where is the evidence that such types are becoming "far too costly and complicated affairs to work with reasonable regard to economy"? The spectre of "complication" is invariably raised as an objection to progress. It was raised when the locomotive first began to supplant the stage-coach. It might with equal reason be urged against the twin or triple-screw steamship as it is against the four-coupled or six-coupled locomotive. Too much stress cannot be laid upon the fact that simplicity of design does not by any means guarantee maximum economy of operation. Further, when it comes to speed pure and simple, the resistance of coupling rods is often vastly overestimated. Why have my highest speed records during the past fifteen years been made, not by single or four-coupled engines, but by six-coupled engines? I take it that one explanation, at least, might be found in the tendency of single-driving wheels to slip at high speeds, which involves a small but constant loss of tractive power when these engines are running fast; certainly the fact I have just mentioned proves that the "complication" of coupling axles does not appear in any way to affect the speed capacity of express engines.

In these articles I have more than once directed attention to the fallacy that a large modern locomotive must of necessity be more expensive to work than a smaller and more simply designed machine. In the hard-working conditions of to-day the evidence points in the other direction. It is in all probability more expensive, from the point of view of both wear and tear and fuel consumption—considerably more expensive—to "thrash" a small locomotive on a heavy main line duty, than to "waste" the power of a large modern locomotive on a light and easy turn, as must inevitably happen at times in working engines on convenient round trips back to their sheds. The difference in constructional cost as between a "single-driver" and, say, a 4-6-2, is far less than in proportion to the difference in weight, seeing that that cost is made up of both labour and materials—chiefly the former—and the difference in the labour required in production as between the two types is disproportionately small.

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And what are to be the leading features of the proposed present-day single-driver? First of all, driving wheels from 8 ft. to 9 ft. in diameter. What diameter boiler does the writer of the letter intend to mount above such wheels, within the narrow confines of the British loading gauge? If anything greater than 5 ft. diameter could be stowed away over 8 ft. wheels, or 4 ft. 6 in. above 9 ft. wheels, I should be very surprised; and yet most modern British 4-4-2, 4-6-0 and 4-6-2 types carry boilers from 5 ft. 6 in. to the vast 6 ft. 5 in. dia.—at the firebox end—of the Great Northern "Pacifics." An adhesion weight of 22 or 23 tons is suggested (incidentally, as compared with the maximum of 20 tons per axle standard on most railways, increasing the probable cost of track maintenance); but it would be interesting to learn how with, say, a 4 ft. 6 in. boiler, 9 ft. driving wheels, and 23 tons adhesion, the machine so designed is expected to be able, not merely to *run* "expresses limited to 350 to 400 tons at speeds varying from 50 to 55 miles an hour," but so much as to *start* an express of this weight away from rest, in any conditions of weather! The whole idea seems somewhat fantastical to me.

The single-driver first began to disappear from our railways because it became impossible, as train-loads constantly increased, to find rounds of duty, day after day, on which engines of this type could be expected to work with reliability and punctuality. Once well started, they gave good and fast service on reasonably light loads, but difficulties in starting, stalling on steep banks, susceptibility to adverse weather conditions or abnormal loads, all told their tale, and the single had to give place to types on which reliance could be placed in all abnormal circumstances. The only present-day express service worked regularly, as regards the major proportion of its trains, by single-wheelers, is the 45-min. Cheshire Lines service between Liverpool and Manchester, but it is impossible to deny that the old-time strict punctuality of these trains has declined in consequence, so that 46 min. and 47 min. are now the usual overall times. Yet these are large and comparatively modern 4-2-2 engines, with 7 ft. 9 in. wheels and superheated—the late G.C.R. "967" class, in fact. I commend to any reader who feels so disposed the self-denying task of inquiring of one of the Great Northern "Pacific" drivers how he would like to take the 5.40 p.m. down Leeds out of King's Cross with a modernised Stirling 8 ft. single, or perhaps the presiding genius on a Great Western

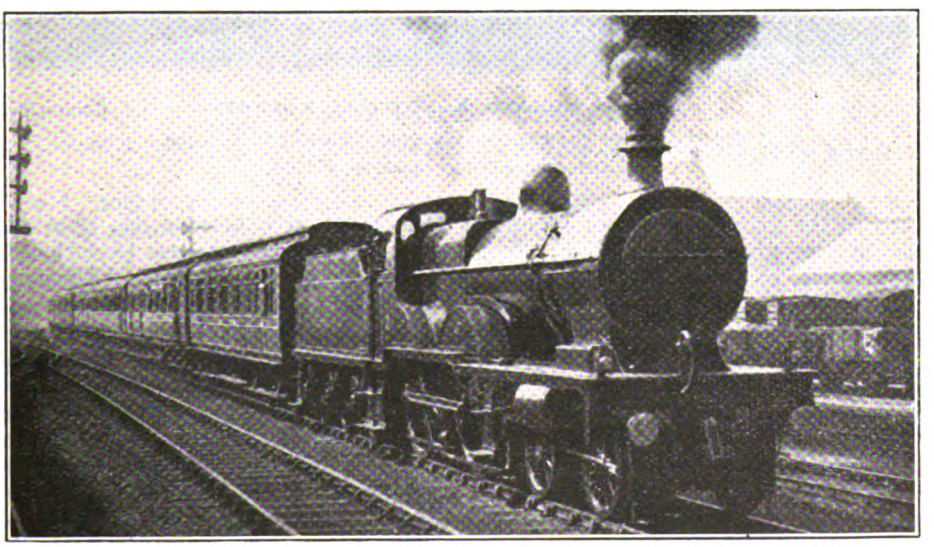

Photo.] **LONDON MIDLAND AND SCOTTISH RAILWAY.** [*Henry L. Salmon.*

Down Scotch express leaving Leicester.
Midland 4-4-0 compound locomotive, No. 1009.

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4-cylinder 4-6-0 would offer some opinions as to the advisability of attempting the down "Riviera" schedule with one of the Bristol and Exeter 9-footers, brought up to date with all modern improvements!

Talking of modern improvements, by the way, there is one which, if brought into successful use at an earlier date than the present might have lengthened considerably the effective life of the single-driver as a type. That is the locomotive "booster," recently fitted by Mr. Gresley to one of the Great Northern "Atlantics"—No. 1419. This development was fully described last month, but a word in regard to the principle will not be out of place in the present connection. It is, briefly, that of affording a locomotive assistance in getting away from rest, or in surmounting very heavy gradients; and it is applied by fitting a small two-cylinder engine—in this case with 10 in. by 12 in. cylinders—to the trailing pair of wheels of an engine of a type having a pair of idle wheels under the cab. The result is to give a very high tractive effort on starting, as the booster engine works through the medium of gearing on to wheels of small diameter; in the Great Northern engine the nominal tractive power is thus increased by 50 per cent., and that at a very small increase in steam consumption—which the excellently steaming boiler of an engine of this type will not have the slightest difficulty in furnishing—and an increase in total weight of round about five tons. But an essential feature of the booster gear is that, as soon as the engine gets into speed at, say, 20 or 30 m.p.h., it can be cut out altogether, after the fashion of the free-wheel of a bicycle, while the engine is in motion, and thereafter the engine runs freely, without any increase of internal resistance arising from the presence of the booster equipment.

In America, the country of its origin, the locomotive booster has been applied with considerable success to various types of heavy mineral engine, but I believe this is the first application to an express passenger locomotive. As is well known, it is customary to allow the G.N. "Atlantics" pilot assistance out to Potter's Bar when loads of important expresses exceed 60 axles, whereas over the rest of the system they have handled 70-axle trains and more with very little loss of time. A booster-fitted engine would require no such assistance. Imagine the use of such equipment, too, on other lines; if the application proves successful, one could look forward in the future to the

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*H. Gordon Tidey.*

Up restaurant car express, Glasgow (Central) to London.
Caledonian 4-6-0 locomotive, No. 63.

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abolition of banking engines on such grades as Shap, Beattock, Whitrope, Falahill, Cockburnspath, Ais Gill, Lickey, Dainton, Rattery, Hemerdon, and many others, the booster providing all the additional power necessary. If the engine concerned has no idle wheels under the cab, why not drive the leading tender wheels with the equipment? It would be a revival, in measure, of the Sturrock steam tender, only in a vastly more practical and efficient form. And, I repeat in conclusion, had the booster been invented and perfected in the day when single-drivers were in the heyday of their popularity, their life comparison with any other G.W.R. timings on the score of difficulty. The 2.55 p.m. up from Birmingham, with its load of well over 300 tons and sharp bookings, culminating in the 70 min. allowed for the 67·5 miles from Banbury to Paddington, is a case in point, as the annexed table bears witness in the second and third columns; this is perhaps my favourite among the up trains, as it is really a case of "all out" the whole way from Snow Hill to Paddington. I need not recapitulate the gradients, seeing that as recently as February of last year I gave a profile of the route.

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

Up "Cornish Riviera" express. Four-cylinder 4-6-0 locomotive, No. 4038, "Queen Berengaria."

and use might at least have been lengthened, although they could not be expected, even with booster equipment, to cope with the running conditions of to-day.

The foregoing discussion has, I fear, somewhat restricted the space available for performance records, but I want to go as far as practicable with the description of a few recent Great Western journeys, commencing with some over the North section. Certain of the heavier Birmingham trains demand something in the way of locomotive work which, in my judgment, if it does not exceed the maximum requirements of the West of England sections, certainly need fear no

The effort of *Prince John* on the 10.20 a.m. up, as timed by a correspondent, was of a tremendously sporting character. Nothing daunted by a series of signal checks from Bordesley to Tyseley, costing 3¼ min., the driver worked up to 48 m.p.h. at Olton, 57½ at Solihull, 70 at Knowle and 77 at Lapworth, followed, after a drop to 69 up the short grade to Hatton, by a maximum of 85½ on Hatton bank, thus losing only 14 sec. to Leamington, and making this initial run of 23·2 miles in a net time of 23 min.! On the 1 in 167 of Southam Road bank, now with a featherweight load of just over 185 tons, *Prince John* accelerated to 53½ and then fell to 51½ m.p.h.; despite a p.w.r. check at

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G.W.R. BIRMINGHAM–PADDINGTON.

Distance.	Engine 4-cyl. 4-6-0 No.: Engine Name: Load (tons tare): Load (tons full):		4045 *Prince John.* §176 §187	4030 *King Harold.* 275 290	4058 *Princess Augusta.* 333 355	4000 *North Star.* †250 †265	4068 *Llanthony Abbey.* †219 †230	Schedule.	Distance.
Mil's		Min.	Min. Sec.	Min. Sec.	Min. Sec.	Min. Sec.	Min. Sec.	Min.	Miles.
0·0	Birmingham ..	0	0 00	0 00	0 00	25 10	—	26	23·3
			Sigs.						
3·2	Tyseley	—	6 56	5 15	5 30	21 05	—	—	20·1
				Sigs.					
7·0	Solihull	—	11 57	10 35	10 00	18 00	—	—	16·3
10·4	Knowle	—	15 13	14 20	13 45	14 55	—	—	12·9
12·9	Lapworth ..	—	17 22	16 35	16 10	12 35	—	—	10·4
17·1	Hatton	18	20 54	20 15	19 55	8 00	—	8	6·2
21·3	Warwick.. ..	—	24 03	23 45	23 20	3 20	—	—	2·0
23·3	Leamington	26	26 14	26 25	26 05	0 00	—	0	0·0
0·0		0	0 00	0 00	0 00	89 45	88 45	91	87·3
6·1	Southam Road ..	—	8 32	9 35	9 35	83 05	82 52	—	81·2
			p.w.r.			p.w.r.	p.w.r.		
11·1	Fenny Compton	—	14 30	14 35	14 50	77 45	77 32	—	76·2
				Sigs.					
16·2	Cropredy.. ..	—	19 26	20 10	19 45	72 30	72 21	—	71·1
					Sigs.				
19·8	Banbury	24	23 19	25 55	24 25	Pass	Pass	Pass	
0·0		0	0 00	0 00	0 00	68 20	68 37	71	67·5
5·1	Aynho Junction	6	6 26	6 55	7 30	61 35	63 08	66	62·4
10·3	Ardley	—	11 22	12 20	13 20	57 25	57 40	—	57·2
14·1	Bicester	—	14 23	15 35	16 35	54 00	53 50	—	53·4
17·1	Blackthorn ..	—	16 27	17 50	18 45	51 40	51 27	—	50·4
20·1	Brill	—	18 40	20 15	21 05	49 15	49 02	—	47·4
23·3	Ashendon Jc.¶ ..	23	21 36	23 20	24 05	46 10	45 32	48	44·2
27·4	Haddenham ..	—	25 40	27 05	27 55	43 00	42 06	—	40·1
32·8	Princes Risboro'	33	31 05	32 30	33 00	†39 00	†37 50	39	34·7
36·0	Saunderton ..	—	34 42	36 10	36 20	35 30	34 50	—	31·5
38·7	West Wycombe¶	—	37 15	38 45	38 55	32 15	31 54	—	28·8
41·0	High Wycombe¶	42	39 59	41 30	41 35	29 15	29 00	30	26·5
45·8	Beaconsfield ..	—	46 17	47 20	47 10	24 45	24 43	—	21·7
50·1	Gerrard's Cross ..	—	50 37	51 20	51 15	20 15	20 42	—	17·4
52·7	Denham ..	—	52 45	53 25	53 20	17 45	18 20	—	14·8
55·4	Ruislip	—	54 56	55 25	55 20	15 20	16 02	—	12·1
57·2	Northolt Junction	58	56 27	56 55	56 45	13 40	14 25	13½	10·3
59·7	Greenford ..	60	58 37	58 55	58 40	11 15	12 04	11	7·8
62·9	Park Royal ..	—	61 25	61 35	61 15	7 50	8 32	—	4·6
64·2	Old Oak C.W. Jc.¶	65	62 54	63 25	62 55	5 40	6 20	6	3·3
			Sigs.	Sigs.	Sigs.		Sigs.		
66·2	Westbourne Park	—	67 00	66 30	66 00	2 40	2 30	—	1·3
			Sigs.	Sigs.	Sigs.				
67·5	Paddington ..	70	69 52	69 35	69 00	0 00	0 00	0	0·0
23·3	B'ham-L'ton net (min.)	26	23	25½	26	25¼	—	—	—
19·8	L'ton-B'bry net (min.)	24	22¼	23½	23¾				
67·5	B'bry-Padd. net (min.)	70	68	68½	68	88¾	87	91	87·3

¶ Service slacks—average figures: Ashendon Jc., 60 m.p.h.; West Wycombe, 55 m.p.h.; High Wycombe, 35-40 m.p.h.; Old Oak Common W. Jc., 30 m.p.h.

§ 202/215 tons Birmingham-Leamington.

† Reduced at Princes Risborough by 48/50 tons (slip portion).

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Fenny Compton, a maximum of 73 m.p.h. beyond Cropredy brought the train into Banbury in a net time of 22¼ min., a further gain of 1¾ min., and a total to engine of nearly 5 min. already. Then followed some "hurricane" travelling. Accelerating to 68 m.p.h. at King's Sutton, *Prince John* went up the 1 in 200 to Ardley Tunnel at a minimum of 58, and then got up to 87 at Blackthorn, the average for ten continuous miles of Bicester bank being 81 m.p.h.! At the short tunnel before Brill the minimum rate was 70, and a maximum of 77 before Ashendon preceded a slack to 53½ over that junction. mon West to Paddington, making 6¾ min. gain to engine from Birmingham.

The second run tabulated was one with an average winter load on the 2.55 p.m. from Birmingham. Again we had signals badly on in the first few miles, from Acock's Green to Olton, and we overtook the obstruction—an up goods—in the loop at Solihull. Thence we accelerated to 65 m.p.h. at Knowle and 76½ at Lapworth, eased to 61 at Hatton, and attained 77½ m.p.h. on Hatton bank, losing only 25 sec. by the slacks; net time from Birmingham was 24½ min. On the 1 in 167 from Leamington we got up to 47½ m.p.h., but a

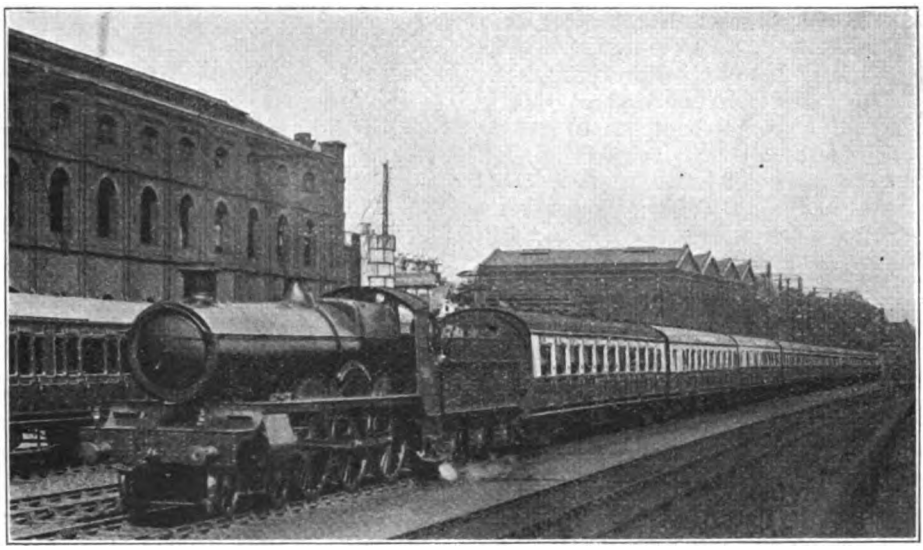

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

Down Birmingham and North express. Four-cylinder 4-6-0 locomotive, No. 4070, "Neath Abbey."

Then the engine was somewhat eased, not exceeding 64 m.p.h. at Haddenham and falling to 49 at Saunderton Summit. At High Wycombe a slight defect developed in one of the cylinders, which occasioned a certain loss of steam at each stroke, but by a plucky continuation of the previous fine running, no time was dropped; minimum rate at Beaconsfield was 47½ m.p.h., and maximum at Denham 79½, and despite a momentary stop for adverse signals at Royal Oak, the gross time from Banbury was still 8 sec. within the 70 min. allowed. Net time was probably about 68 min., allowing the 5 min. of the working book from Old Oak Com- prolonged signal slowing through Cropredy made our time from Leamington to Banbury nearly 2 min. over schedule. Out of Banbury we attained 64½ m.p.h. at King's Sutton, fell to 53 at Ardley Tunnel, touched 80½ m.p.h. below Bicester, slacked to 60 over Ashendon Junction and then accelerated to 66 beyond Haddenham, and went up the 1 in 167 to Saunderton Summit at a minimum of 48½ m.p.h. A maximum of 70½ m.p.h. was reached momentarily ere we slacked carefully through West and High Wycombe (in the latter case to 35 m.p.h.); then we worked up to 56½ m.p.h. on the rising grades to Beaconsfield, falling to 54 at

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the top, and well sustained 82 m.p.h. past Denham. We were still doing 76½ m.p.h. at Greenford, and 70½ at Park Royal, after which followed the usual slow finish, diversified by a somewhat startling acceleration from the usual slowing over Old Oak Common West Junction to 50 m.p.h. before we got to Westbourne Park! Time was slightly improved on from Banbury to Paddington, and the net gain was 1½ min.

The fourth run was in many respects the best, in view of the really heavy load for a booking of this character; it consisted of eleven bogies, of which five were 70 ft. their work cut out to the utmost limit on these trains, without such added difficulties, as witness the fact that my last five runs on this train have given arrivals 9, 8¼, 10, 2, and 4½ min. late, mostly due to running delays, partly to excess station times, and in no case to the engines, which have all regained at least some lost time. But this by the way; it is a matter, I think, capable of remedy, as witness the revolutionary improvement at Didcot in recent years, and is deserving of attention, in view of the keen competition for the London-Birmingham traffic.

By this delay, however, we only lost

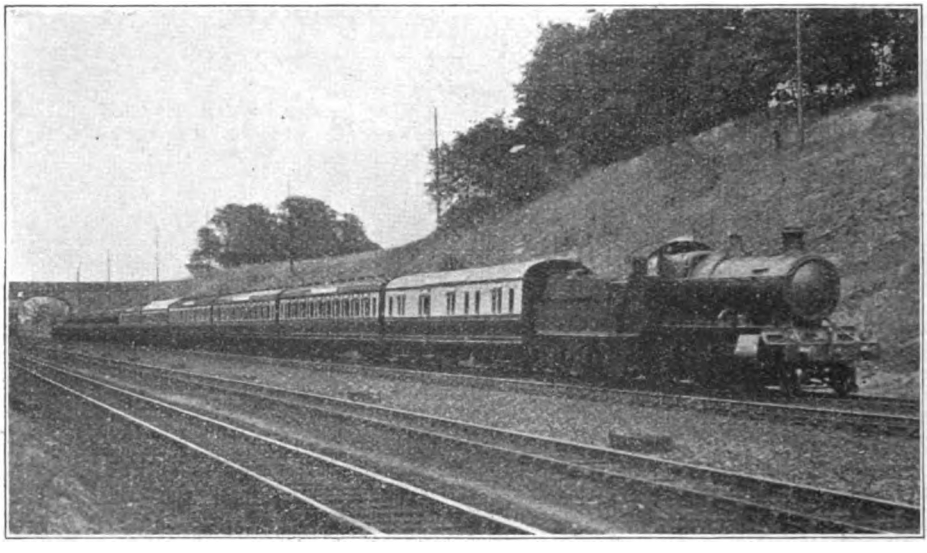

Photo.] GREAT WESTERN RAILWAY. [*H. Gordon Tidey.*

Down Bristol and Weston super-Mare express. 2-6-0 locomotive, No. 5393.

stock. The Birmingham start was inclined to be sluggish—by Great Western standards, let me hasten to add—but we reached 74 m.p.h. at Lapworth, and bettered this with 80½ on Hatton bank, just keeping time to Leamington. On Southam Road bank speed ranged round about 47½-48½ m.p.h., and on the slight grades down past Cropredy we had worked up to 76½ m.p.h., when we got signals badly on at Banbury Junction. This Banbury-Leamington stretch is, indeed, somewhat of a blot on the Great Western Birmingham 2-hour service; it seems exceedingly rare to cover it without signal or permanent way delays, or both, and in both directions of running. The locomotives already have 25 sec. to Banbury, though otherwise we should have run up from Leamington in 23½ min. Out of Banbury we started moderately, not exceeding 57½ m.p.h. at King's Sutton, and falling to 48½ on the rise to Ardley Tunnel; but from Bicester to Brill speed lay entirely between 79 and 85 m.p.h., and then, after slacking to 60 over Ashendon Junction, we achieved the fine feat of attaining 70½ m.p.h. on the level and slight rise to Haddenham, and went right up to Saunderton Summit, with 300 tons, at no lower rate than 53 m.p.h. on the 1 in 167—an exceptional achievement indeed. After the Wycombe slacks we attained 57½ m.p.h. before the minimum of 54 at Beaconsfield, and then

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followed a terrific burst of speed, as we passed Denham at 85 m.p.h., fluctuated between that rate and 79 at Ruislip troughs and Northolt, and went up again to 83½ at Greenford, whence we shut off steam at Perivale, passed Park Royal at 65 and slowed, as usual, over Old Oak Common West Junction. Our average speed over the 12·85 miles from Gerrard's Cross to Park Royal was thus exactly 77 m.p.h., and by this splendid finish we regained a minute from Banbury to Paddington, even though slightly checked through Westbourne Park.

In the down direction the only two recent runs I have had were devoid of note. *Prince John*, on the 12.50 p.m. down, with only 200 gross tons of train, took all but 92 min. to Leamington, time being lost by p.w.r. checks at Beaconsfield and Fenny Compton, to the tune of about 3 min. between them. The running was unenterprising, and continued so after Leamington, with a time of 28 min. 20 sec. to Birmingham (where we arrived 3¼ min. late), but the latter included 50 sec. standing at signals at Moor St., just outside Snow Hill. On the 10.40 a.m. down non-stop train, *King George* had a ten-coach train of 335 tons, was delayed early in the run by an emergency stop at Northolt Junction of 4¼ min. duration, as well as by a p.w.r. check at Fenny Compton—the same stretch again!—and regained none of the loss, despite a maximum of 80½ m.p.h. at Haddenham; so we reached Birmingham 8¾ min. late.

But the down runs tabulated, timed by correspondents, were of a different character, even though the load was very light. Both were made on the 7.10 p.m. down express, which slips two coaches at Princes Risborough, and is booked to make Leamington in 91 min. Incidentally, I wonder how many readers have noticed that the G.W.R. have arranged a "systematic" time-table with their down afternoon expresses on the North main line, at 2.10, 4.10, 6.10 and 7.10 p.m., all, with the 9.10 a.m. from Paddington, being two-hour trains? The 7.10 p.m. usually pulls out with at most eight vehicles, and sometimes only 7, and so is not a serious haulage problem. Evidently the driver of *North Star* is a glutton for speed, as he got some extraordinary downhill work out of his engine, and level work, too; but at the same time some of the maxima recorded by my correspondent, who is, I well know, a careful recorder, are slightly on the high side, and I rather fancy he may have been timing off rail-joints, and assuming 45 ft. rails, whereas the length throughout the G.W. & G.C. Joint Line is the Great Western 44 ft. 6 in. However, I give the speeds as recorded in his log. Maximum at Denham was 71½ m.p.h., after a start of ordinary character, and the minimum at Beaconsfield summit 56 m.p.h.; after that 71 m.p.h. was attained before Wycombe slack. On the 1 in 167 of Saunderton bank the sustained rate was 48 m.p.h., and then the engine blazed away in amazing fashion, with the fastest time from Risborough to Aynho that I have ever seen or heard of—22 min. 35 sec. for the 27·7 miles, allowed 27 min.

My own previous best, which I did not expect to see repeated in a hurry, was 23 min. 15 sec. for the same distance, which included a so far unbeaten record of exactly 7 min. from Risborough to Ashendon. This latter is chiefly the basis on which I imagine my friend's recorded maximum of 89 m.p.h. to be on the high side, as my own maximum, with 10 sec. less in the running, was only 86½ m.p.h. Be that as it may, *North Star* averaged 79·5 m.p.h. for 9·5 miles, slacked at Ashendon to 60 m.p.h., and by an average of 77·1 m.p.h. from Blackthorn to Bicester cannot have been far off 80 at the bottom of the rise to Ardley—my correspondent's record gives 81½. On the rise in question, at 1 in 200-209, speed fell to 62 and then recovered to 65, while 69 was touched on the descent to Aynho Junction, which was passed 4½ min. early. After this the engine was eased very considerably, to avoid any further gains, and the arrival at Leamington, after the perennial check at Fenny Compton, was 1¼ min. early. The unfortunate feature of my other correspondent's log, which appears in the last column, is that he gives no details of his uphill speeds, which must have been wonderful, even with so light a load, in view of such times as 6 min. 23 sec. for the 6·9 miles from Denham up to Beaconsfield, 2 min. 56 sec. from West Wycombe to Saunderton, and so on. The maxima he recorded were 70 m.p.h. at Ruislip troughs, 75 below Beaconsfield, 80 at Haddenham, and 70 before Bicester, with

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an intervening slack to 50 at Ashendon Junction. Despite the commencing signal check at Old Oak Common West, this driver also was 3 min. "up" at Aynho, and went more easily thereafter, but still contrived to reach Leamington in 88¾ min., Fenny Compton slack included. There must verily be but few routes the whole country over to touch this for its succession of "thrills."

North of Birmingham the timings may not be spectacular, but the gradients are very severe all the way to Chester. I do not remember previously having touched upon this route in these columns, and a few notes on the running may therefore prove acceptable to readers. We will commence from the Chester end, after having noted the somewhat singular spectacle of the "crack" 11.45 a.m. from Birkenhead to Paddington arriving at Chester in charge of an express engine of the rival route—nearly always a "Prince" 4-6-0. On my last three up runs our engines were No. 3822, *County of Brecon*, with 215 tons, No. 5366, a "Mogul," with 235 tons, and No. 3715, *City of Chester*, with only 180 tons. There is a falling start to Saltney Junction, where a slight slack is usually made, followed by a level stretch, and then 3¾ miles up at 1 in 82½ from Rossett to Wheatsheaf Junction. The times to Rossett, 7·3 miles, were 10½ min., 11 min. 15 and 35 sec., and to Wrexham (allowed 20 min.) 20 min., 18 min. 40 sec., and 20½ min.; the "County" 4-4-0 made the heaviest weather up the bank, falling to 23½ m.p.h., but the 2-6-0 kept up 36 m.p.h. on the 1 in 82½—quite good, this—and the "City" 4-4-0 maintained 28½ m.p.h. The short run of 4·8 miles from Wrexham to Ruabon, partly on rising grades of 1 in 100-103, occupied 8 min. 25, 15 and 40 sec., as against 9 min. booked.

At Ruabon the loads were increased by the addition of the Barmouth through coaches to 245, 265 and 265 tons for the run to Shrewsbury, and now the "County" made all amends for her poor performance up Gresford bank by passing Baschurch, 17·9 miles from Ruabon, in 19¼ min. from the start, the 8·7 miles from Whittington to Baschurch being covered in 7 min. 55 sec., with a top speed of 74 m.p.h. at Rednal. The gradients on this section are sharply undulating, but mostly in favour of the engine; ½-mile from the start comes a sharp fall of 1¼ miles at 1 in 83 past Cefn, followed by the 2½ miles of Chirk bank, up at 1 in 140; from there (191 mile-post, near Preesgweene) the line falls for some 8½ miles, at 1 in 240-136-132 (3 miles)-178, save for a mile up at 1 in

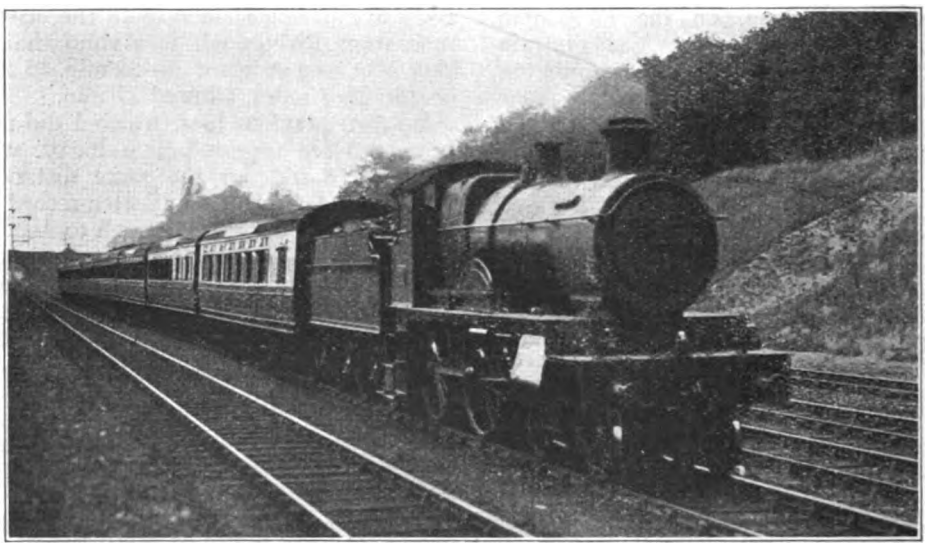

Photo.] GREAT WESTERN RAILWAY. [*H. Gordon Tidey.*

Up Gloucester and Cheltenham express. 4-4-0 locomotive, No. 3810, "County Wicklow."

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136 past Rednal; then it rises from 182¼ to 177 miles, broken by 2 miles falling through Baschurch, and concluding with 1¼ miles up at 1 in 132-123; and the finish is a drop of 4½ miles nearly into Shrewsbury, the final 1½ miles being at 1 in 100. This is a hard road indeed, making the times just quoted all the more creditable. Indeed, perhaps their most creditable feature was the minimum rate of exactly 50 m.p.h. at the mile-post 191 summit, at the top of the 1 in 140 from Cefn viaduct, commenced at 64 m.p.h.

As regards the times made by the "County," the "Mogul" and the "City" respectively, they passed Preesgweene, 5·6 miles, in 7 min. 40 sec., 8 min. (at 40 m.p.h., from 62½ at Cefn), and 7 min. 40 sec., at the even more notable rate of 51 m.p.h., from 64 at Cefn. Gobowen, 7·6 miles (booked 9 min.—a very sharp allowance) was passed in 9 min. 35 sec., 10 min. 25 sec., and 9 min. 40 sec.; Rednal, 12·2 miles, in 14 min., 15 min. 10 sec., and 14 min. 20 sec., maximum speeds in both the last two cases being 66 m.p.h.; and Baschurch, 17·9 miles (allowed 21 min.) in 19¼ min., 21 min. 5 sec., and 20¼ min. After that, signal checks were experienced on all three runs—the authorities at Shrewsbury, like their neighbours at Hereford, always seem as reluctant to welcome the traveller on his arrival as they are subsequently to speed him on his departure, although the palm may be granted to Hereford in this respect—and in consequence total times for the 25·6 miles from Ruabon to Shrewsbury, allowed 32 min., were 29 min. 5 sec., 30¾ min., and 31 min. 40 sec., but net times may be written down as 27½ min. 29¼ min. and 28½ min., all bespeaking very smart performances.

At Shrewsbury engines were changed on each run, a 2-6-0 whose number I did not catch, and No. 6393 of the same type, taking forward loads increased to 270 and 290 tons on the first and second runs respectively, while on the third run 2-cylinder 4-6-0 No. 2990, *Waverley*, came on to an unchanged load of 265 tons. From Shrewsbury, after a sharply rising start at 1 in 130 for ½-mile, grades undulate to the crossing of the Severn at 167 miles (near Upton Magna), whence follows a bank of nearly 10 miles, to Hollinswood Box (down side), 1¼ miles south of Oakengates; of this the steepest pitches are 1¾ miles at 1 in 120 past Admaston, and 2 miles at 165-132 from Wellington, the remainder being mostly at 1 in 200 or so. Then follows Shifnal bank, 4¾ miles at 1 in 150 down, and after that Albrighton bank, 3½ miles at 1 in 137 and 100 up, and steep and sharp undulations continue to Wolverhampton. The principal feature of the grades between Wolverhampton and Birmingham is the 2-mile ascent, mostly at 1 in 96, from Wednesbury to West Bromwich, and the descent from there to Winson Green, with 2 miles at 1 in 100.

From Shrewsbury the two 2-6-0's and the 4-6-0 passed Upton Magna, 3·8 miles, in 6½ min., 8 min. 40 sec. (after a signal check costing 2 min.), and 6 min. 25 sec.; Admaston bank was begun at 64½, 60 and 64½ m.p.h., and its steepest pitch finished at 45, 40 and 45 mp.h.; Wellington, 10·3 miles, was passed in 13 min. 40 sec. 15¾ min., and 13 min. 35 sec.; and the summit at Hollinswood, 14·4 miles, was breasted at speeds of 39½, 37½ and 40 m.p.h. in 19½ min., 22 min. 10 sec. and 19¼ min. Allowance to this point is 20 min. In descending Shifnal bank we were badly delayed on the first run by a bridge repair below Shifnal; on the second No. 6393 kept mostly below 60 m.p.h. and only reached 64½ at the bottom; but the 4-6-0 gave me the highest speed I have ever recorded on the G.W.R. north of Birmingham, with a sustained maximum of 77½ m.p.h. So Shifnal, 17·3 miles, was passed in 22 min. 55 sec., 25 min. 35 sec., and 22 min. 20 sec., and Albrighton, 22·1 miles, in 28¾ min., 30 min. 40 sec., and 26 min. 40 sec., but here the 4-6-0 got a signal check spoiling the ascent of the bank; otherwise an exceptional time might have been made to Wolverhampton. As it was, the times from Shrewsbury were 39 min. 5 sec., 40 min. 35 sec., and 37 min. 50 sec. for the 29·9 miles, or 38 min., 38½ min., and 36 min. net.; 38 min. are allowed. From Wolverhampton the short journey to Birmingham was ruined on the first two runs by an exceedingly severe bridge repairing check at Wednesbury, but on the third 4-cylinder 4-6-0 No. 4058, *Princess Augusta*, covered the steeply-graded 12·4 miles in 20 sec. less than the 19 min. allowed.

In the reverse direction, on the day of that 10.40 a.m. journey, when we reached

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Birmingham 8¾ min. late, we restarted 6¼ min late, and No. 4023 ran with 300 tons to Wolverhampton in 17 min. 35 sec., touching 64½ m.p.h. before Wednesbury, and gaining 1½ min. At Wolverhampton 2-6-0 No. 7304 came on, and her running may be compared with that of No. 5361, of the same type, on another occasion with 215 tons on the Margate train. Codsal, 4·8 miles, was passed in 7 min. 20 sec. and 6 min. 40 sec., after which No. 7304 reached a top speed of 69 m.p.h., and No. 5361 of as high as 72½ m.p.h. (with 5 ft. 8 in. driving wheels) on Albrighton bank. The former was, however, braked to 55 m.p.h. lower down, and the latter had a bad p.w.r. check before Shifnal, which was passed in 15 min. 0 and 20 sec. (12·6 miles). Hollinswood summit was passed on the latter run in 19 min. 55 sec., but No. 5361 was stopped there (15·5 miles in 20 min. 10 sec.) in virtue of a stock train ahead which delayed us all the way to Wellington. This station, 19·6 miles, was passed in 27 min. 50 sec. and 24¾ min., at severely reduced speed on both runs; Upton Magna, 26·1 miles, in 35 and 32 min., at 62½ and 64 m.p.h., and Shrewsbury was reached in 40 min. 40 sec. (36¾ min. net) and 37 min. 25 sec., the time allowed being 38 min.

On the first run the arrears had now been reduced to 3 min., and a 1-min. late start from there was soon wiped out by 4-4-0 No. 3711, *City of Birmingham*, with 175 tons, as the run from Shrewsbury to Ruabon, with all its adverse grades, was actually made in 29½ min., or 3½ min. inside schedule. Baschurch, 7·5 miles, despite the steeply rising start, was passed in 10 min.; Gobowen, 18 miles, in 21 min.; with a maximum of 68 m.p.h. at Rednal, and after a minimum of 48½ m.p.h. at Preesgweene summit, and a maximum of 69 at Cefn, we passed the latter, 23·6 miles, in 26¾ min. On the 215-ton train 2-6-0 No. 4360 passed Baschurch in 11 min. 10 sec., Gobowen in 22 min. 50 sec., and Cefn in 29¼ min., reaching Ruabon in 32¼ min., or 1¾ min. inside the easier 34-min. schedule of this train; maximum speed was 64 m.p.h. at Rednal, and minimum at Preesgweene Summit 45 m.p.h.

From Ruabon the short run to Wrexham was made in 7 min. 40 and 45 sec., booked 8 min., despite a p.w.r. check in the latter case; and then from Wrexham the two trains passed Balderton, 8·1 miles, in 10 min. 35 and 50 sec., and despite delays between Saltney and Chester, reached Chester in 19 min. 5 sec. and 17 min. 10 sec., scheduled 20 and 18 min. Thus the running over this route well deserves observation, and is well and brightly performed, irrespective of the type of locomotive used.

The "silly season" is afflicting our newspapers with a vengeance just now—in their reference to railway matters, at any rate. What can have been the source of this remarkable statement, which appeared recently in a number of papers, even including the *Daily Telegraph* this time? "A speed of seventy miles an hour was attained by the new Scotch flying express between Penrith and Carlisle, a distance of eighteen miles, yesterday afternoon. The train was running from Euston to Glasgow, and the net gain on the entire run was 3 minutes. Nine minutes were lost on the run north, owing to adverse signals." The appropriate comments are: (1) What, pray, is the new Scotch flying express? (2) Is there *any* day on which *any* West Coast express does not attain 70 an hour and more somewhere between Shap Summit and Carlisle, not to mention the maxima of 75 and upwards constantly reached on the East Coast route at Arlesey, Essendine, Newark and elsewhere? (3) Is there any more commonplace occurrence in British express train working than "a net gain of 3 minutes"? Dear, dear, dear! And then the *Daily Mail* publishes a diagram of speeds attainable by various forms of transport continuously for an hour at a time, wherein the aeroplane is credited with 192 miles, the motor with 136 miles, the push-bicycle with 63 miles, *the train with* 61 *miles*, the horse with 39 miles, and so on—all, obviously, racing records but once achieved in history except that of the unfortunate train. That 80 miles, or thereabouts, has been covered by a British train in the hour, and that the modern locomotives of this country have proved themselves capable of steaming continuously at speeds of 75 m.p.h. and upwards for indefinite periods, are facts that matter little. Poor railways! Will the justice of accuracy ever be done to their achievements?

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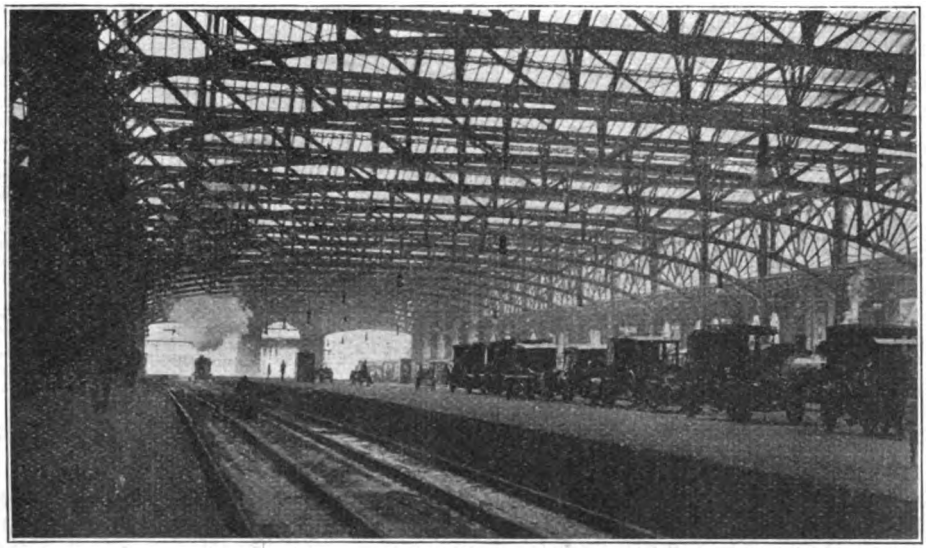

GENERAL VIEW OF PLATFORMS Nos. 11, 12, & 13.

Notable Railway Stations and their Traffic.

GLASGOW CENTRAL, LONDON MIDLAND AND SCOTTISH RAILWAY.

II.—THE STATION AND TRAFFIC ARRANGEMENTS.

By J. F. GAIRNS.

THE principal facts concerning the station and the characteristics of the traffic dealt with there, were described last month by Mr. Charles Travis. In this article the station itself is described.

Considering, for the present, only the terminus, the 13 platforms are usually allocated to particular sections of traffic, a practice adopted wherever practicable all over the late Caledonian system, and one which, in regard to suburban traffic, has much to commend it, in that regular passengers can proceed direct to the platforms they require without enquiry or halting to consult the train indicators. Nos. 1 and 2 usually accommodate main-line trains for the south, including the principal expresses for London, Manchester, Liverpool, &c. No. 2 is also used for main-line stopping trains; Nos. 3 and 4 for Edinburgh express and stopping trains; Nos. 5 and 6 for Wishaw and Hamilton and other local trains; No. 7 for Cathcart "Outer Circle" trains; No. 8 for Cathcart "Inner Circle" trains; and Nos. 9 and 10 for East Kilbride and Ardrossan trains. Nos. 10 and 11 are the principal main-line arrival platforms, while Nos. 12 and 13 are used chiefly for Greenock, Gourock, Wemyss Bay and other "Coast" trains. Except for Nos. 1 and 2, which are almost exclusively utilised as departure platforms (Nos. 10 and 11 being similarly devoted to main-line arrivals), the platforms are utilised for both arrivals and departures, and even those excepted can be, and at times are, so used.

All platform lines are connected either with the four original tracks carried by the old bridge or the nine lines placed upon the second bridge. Except for crossovers and connections, the lines on the original bridge provide two sets of up and down

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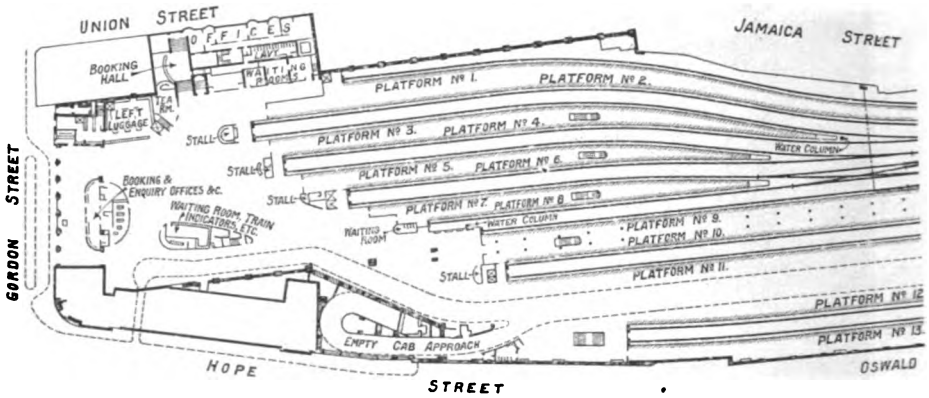

LAY-OUT OF PLATFORMS AND LINES AT

lines, known, respectively, as Nos. 1 and 2 up and down lines. On the newer bridge, however, there is a wide range of connections and crossovers and one or two terminal engine lines associated with Nos. 3, 4 and 5 pairs of up and down lines, together with a few siding sections or shunting necks. It frequently happens that three trains arrive and three depart almost, if not quite, simultaneously, and shunting movements can also be going on at the same time. The arrangement of approach lines and the very comprehensive series of track connections and interconnections at each end of the bridge and upon the newer section is, however, far too complicated for description without the aid of a diagram, and the plan reproduced must, therefore, be allowed to suffice in this respect. South of the bridge, and adjacent to Bridge Street Junction box, a number of sidings are provided, there being, in fact, at one point no fewer than 17 roads, including sidings and loops.

No. 1 platform has a short "lie-by," known as Coliseum siding, at its outer end, in which a spare or shunting engine can be placed. No. 1 platform is only connected directly with No. 1 Up and Down lines. No. 2 set of up and down lines can be reached at the south end of the old bridge, thus affording connection with the Glasgow and Paisley Joint line at Bridge Street Junction. No. 2 platform is similarly restricted in regard to its whole length, but some 40 yards short of the end of the platform there are connections to the new bridge system of lines. Nos. 3, 4, 5 and 6 platforms are relatively short, and they are thus able to connect with most lines on both bridges. Nos. 7 and 8 have about the same length, and as they are chiefly utilised for the frequent Cathcart "Circle" services an engine siding is provided to serve both. Platforms 9 to 13 are accessible only via the new bridge Nos. 9 and 10 platforms are of considerable length, extending beyond the station roofing on to the bridge itself. Between platforms Nos. 11 and 12 there is a wide carriage road, thus rendering No. 11 particularly suitable for the arrival of important express trains from England requiring to be served by considerable numbers of taxi-cabs and involving heavy luggage transfer, while No. 12 is similarly convenient for the arrival of the more important coast and Clyde steamer trains which also, in the season, bring many passengers accompanied by luggage and requiring cabs. This section of the station is covered by an extension of the roofing system, and its outer end on the new bridge has a double-sided loading bank equipped with a crane and other conveniences, and roofed over independently of the general station roofing. No. 13, alongside the boundary wall, is also extended on to the bridge, and at its outer end has a short dock.

As already mentioned, and as will be seen from the plan reproduced, the platforms are arranged *in echelon*, that is, they terminate on a diagonal system, thus obtaining a passenger distribution which could not be realised were all the buffer stops in line. This arrangement, in conjunction with the necessarily complicated and irregular track lay-out, and the way in which the platforms are grouped

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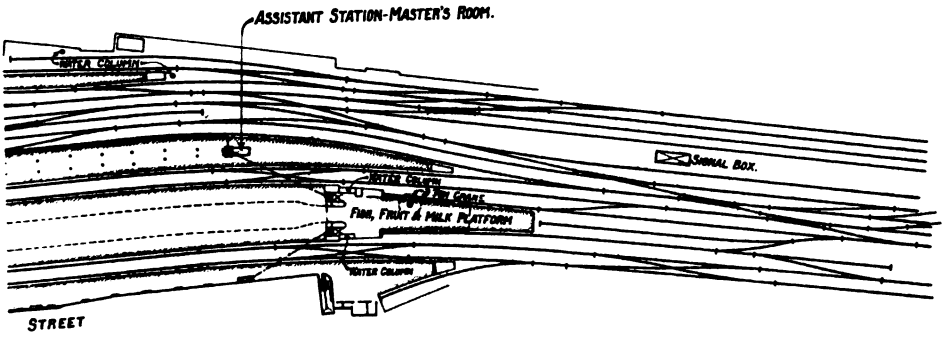

GLASGOW CENTRAL (HIGH LEVEL) STATION.

together, causes the platforms to vary greatly in length, as follows:—No. 1, 794 ft.; No. 2, 900 ft.; No. 3, 615 ft.; No. 4, 578 ft.; No. 5, 503 ft.; No. 6, 432 ft.; No. 7, 433 ft.; No. 8, 346 ft.; No. 9, 954 ft.; No. 10, 923 ft.; No. 11, 812 ft.; No. 12, 680 ft.; and No. 13, 809 ft. Although some of these are relatively short, there are sufficient long platforms to accommodate the chief main-line trains and other services which load heavily, while the shorter platforms meet all ordinary requirements.

The signalling is entirely electro-pneumatic, on the Westinghouse Brake and Saxby Signal Company's system. The entire working of the station is concentrated in one signal cabin, carried on the adjacent girders of the old and new bridges. This replaces three manual cabins previously employed. All levers are of miniature type—7 in. high—placed on a raised frame running longitudinally along the cabin, and there is a through passage in the middle of the frame dividing it into two sections. A large illuminated diagram is suspended diagonally from the roof, and on a ledge over the lever frame are the various instruments, indicators, &c. At one end, placed transversely so as to be visible by all the signalmen, is an indicator operated from the platforms, showing in illuminated figures when a train is ready to depart. A similar indicator is provided at the other end of the signal-box describing approaching trains, and showing the lines on which they will arrive. Numerous other indicators, &c., are provided to aid the signalmen in the manipulation of the traffic. Several of the lines are track-circuited, and a system of "route" locking is in operation between the home signals and the platforms, while each platform has a system of locking operated by balanced bars showing the occupation of the platform lines. Where platforms are long enough to accommodate two trains the inner and outer sections are separately safeguarded. An important feature is that route-indicating signals are extensively employed, thus reducing the number of arms which would have to be provided. Speaking generally, each platform has a main starting signal and a shunt arm below it for departing trains, with an indicating casing showing the number of the line on which the train is to travel. Where intermediate connections occur in the case of long platforms, signals are provided there as well as at the outer ends. The outer home signals at the south end of the bridge have indicators which show the line over which the train will pass and the inner home signals have indicators showing the number of the platform at which it will arrive.

For shunting movements on to the bridges the letter ".S" is shown on the indicators. Dwarf and other auxiliary signals for shunting purposes are, of course, provided in the station on the approach lines as required. At night, when the signals are at danger, the indicators alongside them show "white light" triangles outlined by small holes. For the crossover roads entirely within station limits, six dwarf lever frames are provided, and these control the crossovers at the terminal ends of Nos. 2 and 3, 4 and 5, 10 and 11, and 12 and 13 platforms,

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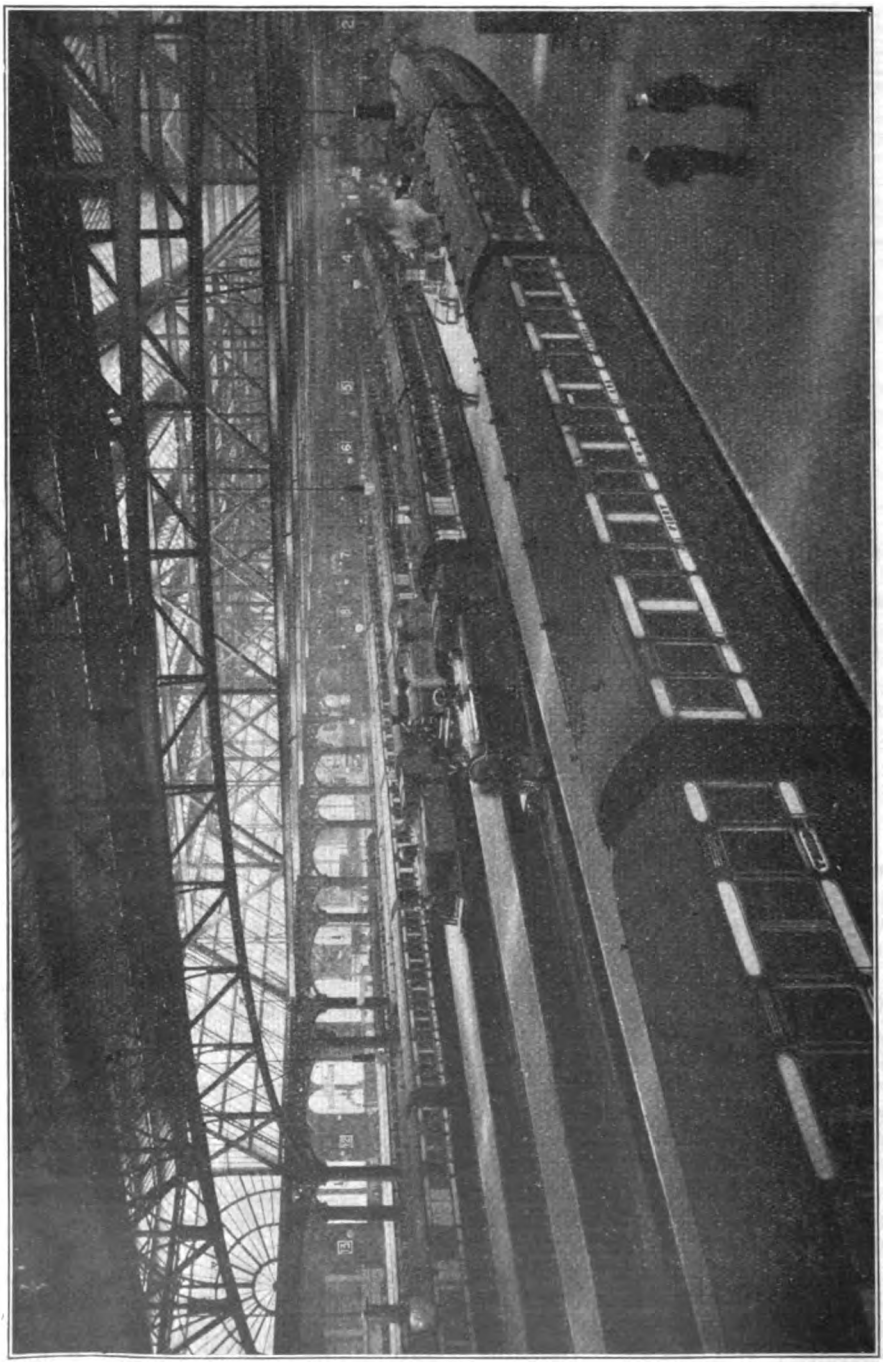

GENERAL VIEW OF INTERIOR OF GLASGOW CENTRAL STATION.

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and at the outer ends of Nos. 10 and 11 and 12 and 13. These are operated by the station staff and are controlled from the signal box. The main signal frame contains 374 levers, 258 for signals, 79 for points, and 37 spare. It may be mentioned that the next cabin, at Bridge Street Junction, is of mechanical type, having 160 levers, of which 131 are in use.

Perhaps more than any other "Central" station, this terminus justifies its title, in that it is bounded on three of its sides directly by three of the principal thoroughfares of the city, and its immediate vicinity is, to all intents and purposes, the starting point of the exceptionally complete system of tramways operated by the Glasgow Corporation. The main entrance is from Gordon Street, a short thoroughfare connecting Buchanan, Union and Hope streets. The Gordon Street frontage has a courtyard protected by a glazed roof, and gives access to the main booking office. Here is also the principal block of the Glasgow Central Station Hotel buildings, this hotel ranking as one of the largest and best and most important in Glasgow. There is also a busy entrance by stairways from Union Street, leading direct to the circulating area, while access for vehicles only can also be had from Hope Street via a carriage-way following a curved path to reach the roadway between platforms Nos. 11 and 12. There are also two entrances from Hope Street, one leading to the north end of the concourse and the other to the ends of platforms Nos. 12 and 13. From Argyle Street there are two other entrances, both with booking halls, one on the east side of the bridge or covered way, which carries the station across Argyle Street, and the other on the west side, at the corner of Argyle and Hope streets. Both of these connect with a system of passages leading also to the Low Level station, while stairways give direct access to all platforms except Nos. 1 and 2, which can only be reached from the main circulating area.

Dealing first with the main booking hall, on entering from Gordon Street there is an office for booking luggage in advance and a Lost Property Office connecting with the Left Luggage Office, which continues it on to the circulating area. In the hall itself, a range of booking windows is provided, and behind this is a curved range of offices between two wide passages providing for access from the booking hall to the circulating area, including a Public Enquiry Office, an office for reserving seats and sleeping berths, and several auxiliary booking windows. Passing on to the main circulating area, beyond the Left Luggage Office on the left-hand side (a large department having three public counters and connected by hoists with storage premises below) a stairway may be noted, leading to the stationmaster's and the Season Ticket offices above and also communicating with a range of offices occupied by the District Superintendent, Mr. John Mason, and his staff. Next to this stairway is a large tea room (with extension premises on the floor below) which is very popular with Glasgow residents as well as with travellers. It also has a public entrance direct from Union Street. Alongside this is the stairway access from Union Street already mentioned, and in this fruit, confectionery and tobacco stalls are situated. On the other side of this stairway, and leading towards the end of No. 1 platform, is a range of premises including a general refreshment room, and ladies' and gentlemen's waiting rooms; also a stairway to a Low Level lavatory which extends transversely from side to side of the station at this point. Over these are premises including a conference room, guards', inspectors' and ticket collectors' rooms and an employees' restaurant. Below them, fronting upon Union Street, are several shops, one of which is utilised as a parcels receiving office for the Caledonian Railway Company, others being let out to tradespeople.

To the right of the booking hall, entrances are provided to the Central Station Hotel above this part of the station and extending for a considerable distance along Hope Street. Between the roadway leading up from Hope Street to the cab rank between platforms Nos. 11 and 12, and the main circulating area, is a torpedo-shaped block of buildings. On the circulating area side of these buildings may be noted first a public telegraph office, then an office occupied by the Glasgow representative of the Pullman Car and International Sleeping Car Companies, Mr. C. M. Trott. Next is a shop parcels office, and beyond it a bookstall. On the roadway side of this block there is a letter room for dealing with the

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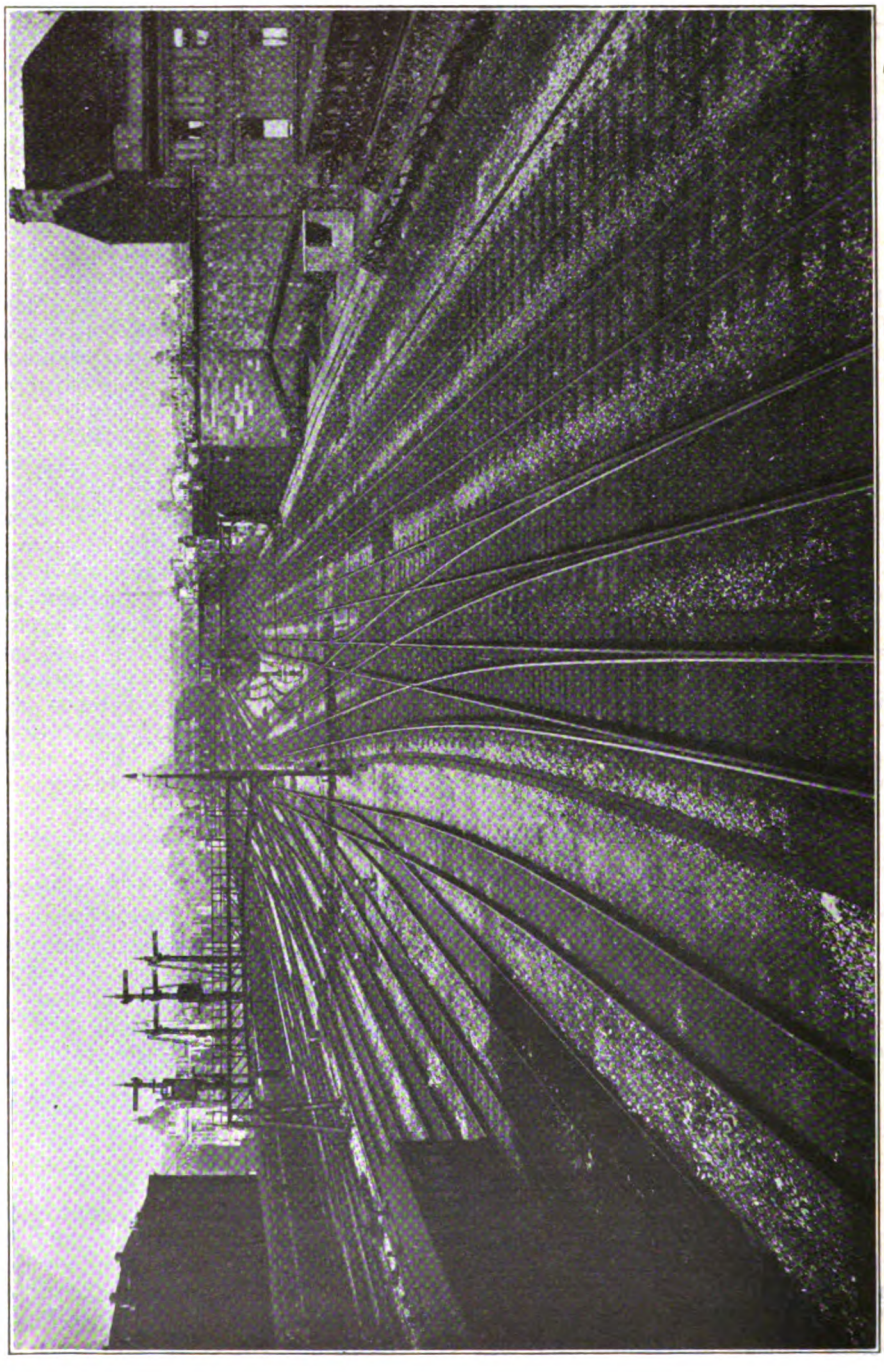

THE APPROACH TO GLASGOW CENTRAL STATION.

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arrival and despatch of railway letters and, at the end, a stairway forms another entrance to the Low Level lavatories previously referred to. Above this block the outstanding feature is the well-known series of train information windows, from which are exhibited announcements as to the departure of trains from various platforms. These are readily visible from all parts of the circulating area and constitute one of the most useful features of the station equipment, in that passengers only need to glance up and proceed directly to the platforms they require. Behind are various staff offices. Lined along the platform side of the circulating area may be noted the well-known semi-circular book-stall, surmounted by an artistic clock tower, behind the buffer stops of platforms Nos. 2 and 3; confectionery, fruit and tobacco stalls behind the buffer stops of Nos. 4 and 5; tobacco stall and inspectors' and other staff offices adjacent to the ends of platforms Nos. 6, 7 and 8; a ladies' room at the end of No. 8; and another bookstall behind the buffer stops of platforms Nos. 10 and 11. A distinctive feature of this part of the station is the arcade of columns extending between platforms Nos. 9 and 10, and carrying the roof girders where the older and newer portions of the station join.

The roadway between platforms Nos. 11 and 12 is served on the one side by the thoroughfare, already mentioned, passing alongside the main circulating area, while a separate approach for empty cabs is provided from Hope Street, following a looped path to reach the level of the station itself, joining the other portion near the ends of platforms Nos. 12 and 13. In the angle may be noted the cab office and a store for sleeping car and other requisites. A Post Office mail room, a tobacco stall and stairways connecting with the Low Level station premises below are also located in this part of the station. Other matters calling for attention are the offices near the outer ends of platforms Nos. 9 and 10 providing accommodation for the foreman shunter, who is usually in communication with all parts of the station and the signal cabin and for the locomotive inspector. Usually during the busy period for arriving and departing trains the assistant stationmaster on duty is stationed here, as he has a good view of the whole of the station from this point and is able to communicate at once to any part by telephone. The loading bank at the ends of platforms Nos. 11 and 12 is provided with a 3-ton crane and with hoists connecting with underground premises. It is enclosed by gates so that consignments unloaded to road vehicles cannot leave except under supervision. Adjacent to the loading bank at the end of No. 13 platform accommodation is provided for carriage examiners, locomotive inspectors, &c. Powerful hydraulic buffer stops are provided at the ends of all platforms. Telephone boxes, enabling the staff to communicate with the signal cabin and with various parts of the station are provided on each platform. The numbers of the various platforms are clearly indicated by large suspended numerals.

At the Argyle Street end of the station the eastern entrance includes a curved passageway with booking windows on one side and accommodating confectionery and tobacco stalls. There is also a large clock and a train indicator showing the platforms from which trains for various destinations will depart. The passage is continued to communicate with stairways leading to various platforms, and also with the system of passageways from the Hope Street entrance, by which access is given to various parts of the station premises and to the Low Level station. The main access to the latter is actually adjacent to the Hope Street entrance, where ticket examiners and collectors' gates are provided, but by the system of passageways it can be reached from any part of the main station. There is also a connection from the Hope Street entrance to an auxiliary hall and stairway on the opposite side of Hope Street. An important characteristic of Glasgow Central station is the general use of glazed tiles throughout the complex system of underground passageways and the artistic stone and cabinet work wherever suitable.

Besides the public premises there is a network of departments located below the main station, thus utilising the arches upon which the station as a whole is built. Among these are the cellar and underground premises associated with the hotel, the lamp room, Pullman stores, heating plant, electric light and power station, plant for supplying the electric signalling

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apparatus with current and with compressed air, and an extensive range of parcels offices. These are served by hoists from platforms Nos. 1, 6, 7, 10, 11 and 13. No. 10 hoist also connects with the Low Level station. There is also a loading bank, used for fish, yeast and various heavy traffic, connected with platforms Nos. 11 and 12 by hoists. Below the parcels office proper are lower arches accommodating the lost luggage store. In addition to supplying steam and hot water heating for station and hotel premises, the boilers have connections with a system of pipes alongside tracks in the station by which standing trains can be heated before the locomotive is attached.

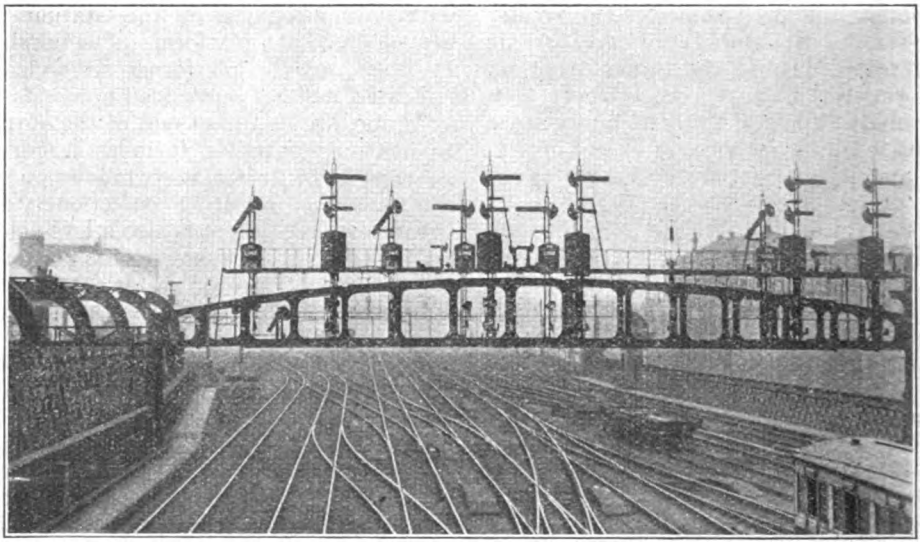

Photo.] [*J. F. Gairns.*

SIGNAL BRIDGE, WITH ROUTE-INDICATING SIGNALS, ON CLYDE BRIDGE,

Photograph taken from the station direction.

A few traffic statistics concerning Glasgow Central station may now be given. Ordinary arrangements provide for 246 arriving and 235 departing trains. The busiest morning period is between 8 and 10 a.m., when 50 trains arrive, while between 4 and 6 p.m. there are 54 departures. At holiday periods there may be as many as 150 additional trains, while at all times, and particularly adjacent to the holiday seasons ordinary trains have to be strengthened and reliefs frequently run on Saturdays, especially on the Coast services. Of the suburban routes the Cathcart "Circle" is the busiest, there being 13 arrivals between 8.30 and 9.30 a.m., and 15 departures between 5 and 6 p.m. According to the latest statistics available about 65,000 passengers per day are dealt with at Glasgow Central station, a large proportion travelling with zone and season tickets. An important feature of the traffic, especially in regard to the Cathcart "Circle," is the midday traffic of season and zone ticket holders travelling home for the midday meal and returning. About 6,000,000 passengers are booked at the Central station in the course of 12 months. On Saturday nights and before public holidays the station is exceptionally busy, almost every available square foot of the extensive circulating area being occupied by passengers proceeding to or from trains or waiting. On Saturday afternoons numerous additional trains have to be provided to meet the football traffic, while reliefs are occasionally necessary when important matches are arranged in mid-week. On early closing days in towns within a few miles of Glasgow, and on "merchants' holidays," the Central station is also rendered very busy owing to the large numbers of people who come into Glasgow.

Beside the passenger traffic there is a

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heavy traffic in parcels and fish from the coast to Glasgow, and thence to other towns and to England, and dead meat for London. It is estimated that during an average period of 12 months nearly 3,000,000 packages are handled, together with over 1,000,000 packages of a miscellaneous character, representing a weight of some 30,000 tons.

Glasgow Central station is, of course, mainly concerned with the traffic of the Glasgow area, and to and from principal towns in the southern counties of Scotland, most of the northern traffic being dealt with at Buchanan Street. There are, however, two or three trains to or from the north which use the Central station, and certain inter-change services are operated for luggage, parcels and other purposes. There is no need to consider the traffic of the Central station in detail, but a few notes in regard to the principal Anglo-Scottish services may be given.

The first important arrival is that of the postal train from London, due at 5.25 a.m. At 6.55 a.m. (Mondays excepted) and at 7.16 a.m. (Mondays only), the first of the London sleeping car trains is due, followed by a train from Liverpool and Manchester at 7.40 a.m. At 9.35 a.m. the 11.40 p.m. sleeping car express from London arrives. At 3.20 p.m. the restaurant car express from Liverpool and Manchester arrives, followed by another one at 6.5 p.m., while at 6.15 p.m. the 10 a.m. restaurant car express from London is due. The through Glasgow portion from London of the 1.30 p.m. ex Euston arrives at 10 p.m., while a Manchester and Liverpool restaurant car express is due at 11 p.m. The most important departing trains are the 10 a.m. London, Birmingham and West of England, the 10.10 a.m. Liverpool and Manchester, the 1.30 p.m. for London, Liverpool and Manchester, the 4.10 p.m. Liverpool and Manchester, the 5.30 p.m. up limited mail for London and West of England, the 6.35 p.m. up postal for London, the 9.30 p.m. sleeping car train for London, the 10.30 p.m. sleeping car train for London, the most important sleeping car express from Scotland to the south, with, on occasion, as many as seven sleeping cars, and the 11.5 p.m. (sleeping car train) for Liverpool and Manchester.

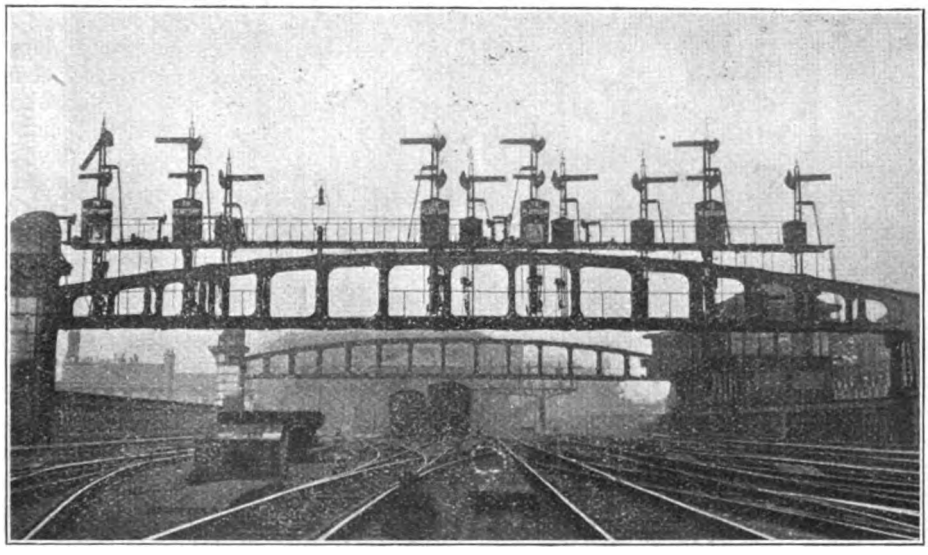

Photo.] [*J. F. Gairns.*

SIGNAL BRIDGE, WITH ROUTE-INDICATING SIGNALS, ON CLYDE BRIDGE.

Looking towards Central Station, showing Signal Cabin.

The traffic staff at Glasgow Central station is under the supervision of Mr. R. Scorgie, stationmaster. He has two assistant stationmasters, Messrs. J. Rankin and T. Creighton. Their staff includes 3 station clerks, 2 yard inspectors, 7 station

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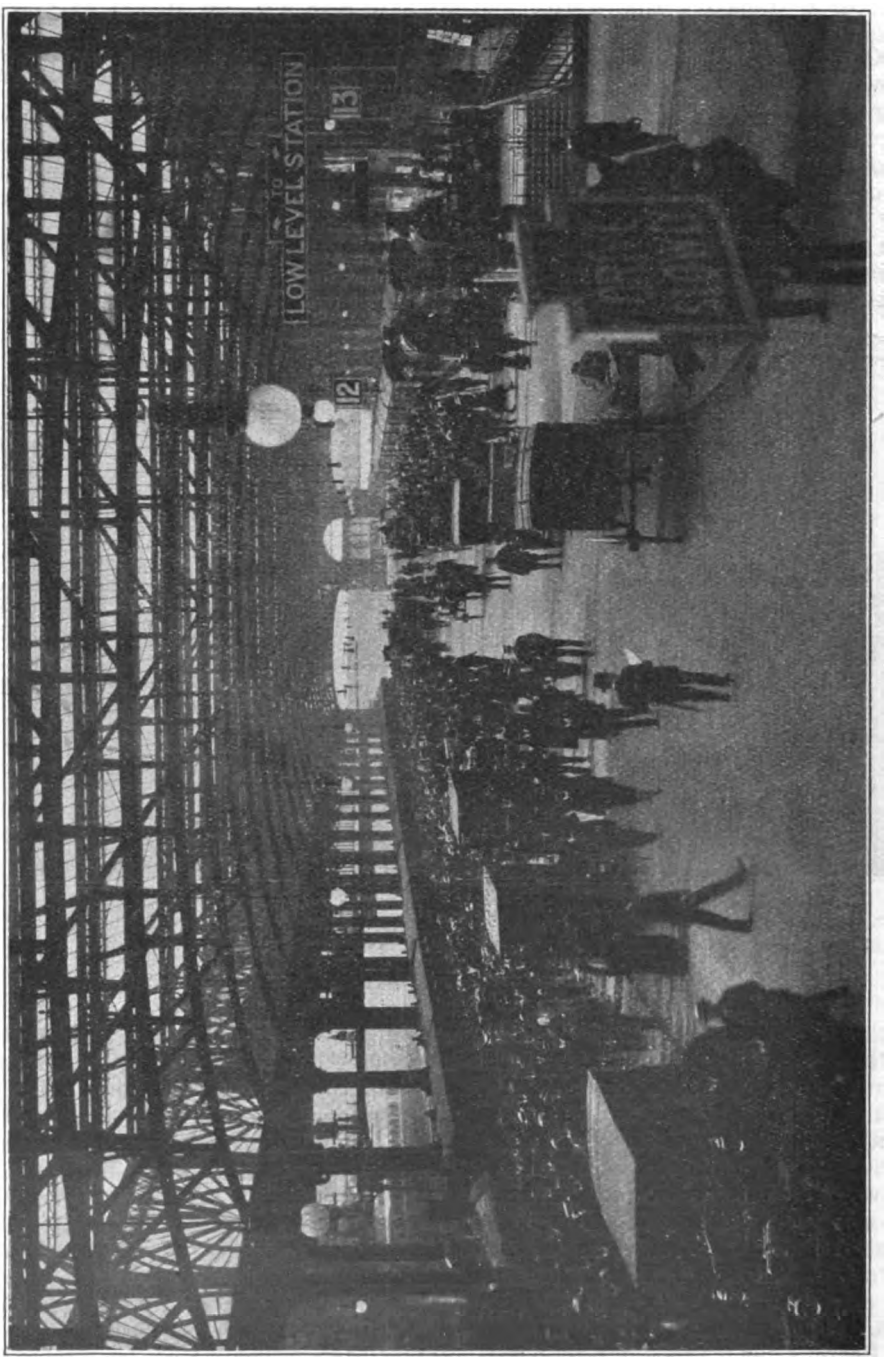

GENERAL VIEW IN THE WEST SIDE STATION.

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inspectors, 18 signalmen, 7 cabin boys, 1 telephone boy, 4 excess luggage collectors, 25 ticket collectors, 4 station foremen, 8 parcel porters, 41 porters, 1 billposter, 2 searchers, 2 letter sorters, 5 porter guards, 1 underman, 7 waiting room attendants (female), 38 guards, 22 carriage cleaners (female), 9 carriage lampmen, 35 yard foremen and shunters, 16 cloakroom attendants, and 6 police. The parcels department is under Mr. R. Hair, whose staff numbers 134, and the 30 clerks in the booking offices are under the charge of Mr. W. Murray.

A few remarks may now be made in regard to the Central Low Level station. This has two island platforms, there being in each direction a loop between the tunnels at either end, so that while one train is waiting to entrain or detrain passengers (a stop of 2 or 3 min. being usually allowed), a second train in the same direction can be brought into the station, and pass the other if required. As a rule, all trains serving particular routes or destinations use the same side of a platform, so that waiting passengers are automatically divided into two sections, distributed on either side. There are two signal cabins, East and West, and containing, respectively, 14 levers and 15 levers. About 150 trains ordinarily use the Low Level station, but there are, in addition, a number of goods and mineral trains which proceed this way. As a rule, though it is not always practicable, tank or tender locomotives fitted with condensing apparatus work trains on Low Level routes. Although ranking generally as part of the Central station, and having hoist connection directly to the parcels department and to the main-line station above, the Low Level station has its own stationmaster, Mr. A. Shankie, under whom are the ticket collectors, platform staff and signalmen attached to the Low Level station.

The writers of both sections of this article are indebted to Mr. D. A. Matheson, Deputy General Manager for Scotland, Mr. R. Killin, C.B.E., now General Superintendent, Midland Division, and Mr. J. Ballantyne, C.B.E., the present General Superintendent of the Northern Division, London Midland and Scottish Railway, and to Mr. J. Mason, District Superintendent, for much of the information utilised, while they have to acknowledge the material assistance and many courtesies rendered by Mr. Scorgie and the two Assistant Stationmasters, Messrs. Rankin and Creighton.

MR. R. SCORGIE.

Stationmaster, Central Station, Glasgow, London Midland and Scottish Railway.

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British Express Trains in the Summer of 1923.

AN ANALYSIS OF FASTEST AND LONGEST RUNS, RESTAURANT, PULLMAN AND SLEEPING CAR SERVICES, AND SLIP COACHES.

By "VOYAGEUR."

TO have acted as a false prophet is a regrettable *rôle* to which the writer must plead guilty as he reviews the remarks that he made under this heading a year ago. Having rendered the necessary apologies to readers of the RAILWAY MAGAZINE, however, it is with the greatest pleasure that he sets out, here and now, to eat his words, in order to pay tribute to the really magnificent programme of summer express trains offered by the grouped railways to the public as the first fruits of grouping. Looking forward from 1922 into the peculiarly uncertain future of 1923, he wrote: "Competition, save in certain limited areas which form points of contact between groups, will have become as dead as the Dodo." Instead of which, competition to-day between railway groups seems more keen and virile than it has been for long years past between individual companies.

Old-time competition, such as that of the North British Railway for the Glasgow-Aberdeen traffic and the London and South Western Railway for the London-Plymouth traffic, is being revived; cross-country competition, such as the Aberdeen-Penzance and Liverpool-Lowestoft services, is arising in unexpected directions; and the very advertising of the great groups one against another is a sheer joy to the beholder. Who could have foreseen the day when we should see the staid contents of a railway advertisement enlivened by the legend: "The largest and most powerful locomotives in the country pull you from King's Cross"? Or the day in which another great company would schedule a run fast enough to take the top place in the speed table, and so far from being nervous of apprising the public of the fact—as might have been the case in days gone by—not afraid to let it be known that three minutes were gained, and a speed of over eighty miles an hour was attained on the very first journey? Yes, these post-war days are days in which speed of transit has become of paramount importance, and the grouping of the railways, so far from retarding the process of post-war recovery, appears materially to have expedited its progress.

And so, instead of the tables which follow becoming "the merest shadows of their former bulky selves," with the corollary that "their fascination must of necessity shrink in the same proportion," I find that the said tables are inclined to grow, while their interest has more than proportionately increased. Amply sufficient of the individuality of the original companies still remains to enable the exploits of the various "sections" or "divisions" of the groups to be recorded separately in the tables, as before, while the tables themselves reveal significant instances of the interworking which grouping alone could have rendered possible. Also, for the first time since the war period, the average all-round approximation to pre-war conditions is so close that I have found it practicable to omit from the tables the comparison with 1918, leaving only the comparison with the times and facilities offered in 1914.

It took four years of war to reduce British express train services to the lowest ebb of speed and comfort that they had known for decades; and now five years of conditions peculiarly difficult, from the economic standpoint, have sufficed to restore, and more than to restore, the facilities of the past. For in many directions the facilities now offered surpass any that have been known previously. In the accompanying table "A," out of

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65 services tabulated to and from London, 17, or 26 per cent., are shorter times than the best of 1914, if only by a minute or so, and another 28 per cent. are equal to the 1914 times. A total of 82 per cent. of the times are either faster than, equal to, or not more than 5 per cent. slower than those of 1914. In many directions *average* transit times, if they could be reduced conveniently to tabular form, would show figures even more favourable to 1923, as compared with 1914. Restaurant car and Pullman car services have increased almost out of recognition; and another valuable outcome of grouping, again not easy to reduce to the tabular, has been the extensive increase in through facilities for making rapid and comfortable cross-country journeys in all directions.

With this preamble, let us proceed to a consideration of Table "A," which shows the fastest times operating between London and a selection of 40 cities, towns and holiday resorts, chosen in such a way as to show both the results of competition, and also the speeds offered by each important group section apart from any such adventitious aid. The table shows the difference between 1914 and 1922 in each case, on both a time and percentage basis, as well as the acceleration which has taken place in each case over the times of last year. The ultimate slowing of train services which had taken place at the date of the armistice, as compared with the times of the summer of 1914 (taken from the figures in this table) was as follows:—

	Per cent.
Great Central Railway	8·5
Great Western Railway	17·6
London & South Western Railway	18·5
East Coast Railways	20·0
West Coast Railways	21·0
London & North Western Railway	25·7
Great Northern Railway	26·1
London, Brighton & South Coast R.	26·3
Great Eastern Railway	26·5
Midland Railway	30·5
South Eastern & Chatham Railway	36·0

The general average worked out at 23·14 per cent., or all but 14 minutes added to every hour of travelling time. Now look at the figures of the summer of 1923, compared in the same way with those of 1914, and drawn as before from Table "A":—

	Per cent.
Great Western Railway	—1·69
Southern Rly. (S.E. & C. Section)	—1·20
Southern Rly. (L.B. & S.C. Section)	—0·87
L. & N.E.R. (Great Northern Sect.)	—0·80
L.M. & S.R. (L. & N.W. Section)	0·05
L. & N.E.R. (East Coast Sections)	0·76
L. & N.E.R. (Great Central Sect.)	1·66
L.M. & S.R. (West Coast Sections)	2·18
L. & N.E.R. (Great Eastern Sect.)	2·60
Southern Rly. (L. & S.W. Section)	3·46
L.M. & S.R. (Midland Section) ..	5·90

Sorting these averages out into the four groups, we get results as follows:—

	Per cent.
Great Western Railway	—1·69
London & North Eastern Railway	0·70
Southern Railway	1·01
London Midland & Scottish Rly.	3·46

The average for the whole 65 services is 1·40 per cent., which amounts to the negligible all-round figure of 50 *seconds per hour* increase over the journey times of 1914. That is to say, practically full pre-war speeds have now been restored.

Some of the railways are a little unfortunate, so far as concerns the working out of these percentages. Thus the L. & S.W. section of the Southern group gets a low figure on account of the best Bournemouth time being 11·7 per cent. slower than the best time (2 hours) of 1914. Yet the *average* time between Waterloo and Bournemouth, with the splendid hourly service now operating, is something like ten minutes less than the average time of 1914, so that the whole service is considerably better. At the same time, one might suggest the desirability, when next year's summer programme is being drawn up, of reinstating at least one or two non-stop expresses between Waterloo and Bournemouth in the old two-hour time; perhaps the purely additional trains, such as the 10.30 a.m. and 3.30 p.m. down, could be so dealt with. Most of the other worst figures belong to the Midland Division of the London Midland and Scottish, but in palliation it may be said of at least four of them that they represent places to which a faster service is given from London by the Western Division of the same group, so that there has not been any necessity for acceleration, from the competitive point of view. At the same time, one is surprised to see the Midland not making a harder fight for the traffic between London and Leeds, Bradford, the West Riding

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FASTEST TIMES BETWEEN LONDON AND PROVINCIAL TOWNS IN 1914 AND 1923.

Town.	Distance from London	Fastest Time, July, 1923.	Railway.	Section.	Direction.	Fastest Time, July, 1914.	Increase, 1914–1923.		Accel. 1923 over 1922.
	miles.	h. m.				h. m.	h. m.	per cent	min.
Aberdeen ..	523·2	11 10	L. & N.E.R.	E. Coast	Down	11 05	0 05	0·8	42
,, ..	539·7	11 20	L. M & S.R.	W. Coast	,,	11 15	0 05	0·8	45
Birmingham ..	112·9	2 00	,,	L. & N.W.	Both	2 00	Nil	0·0	0
,, ..	110·6	2 00	G.W.R. ..	—	,,	2 00	Nil	0·0	0
Bournemouth..	108·0	2 14	S.R. ..	L. & S.W.	Up	2 00	0 14	11·7	1
Bradford (*a*) ..	194·1	3 54	L. & N.E.R.	G.N. ..	Down	3 56	—0 02	—0·9	21
,, (*b*) ..	209·7	4 30	L.M. & S.R.	Midland	,,	4 13(*r*)	0 17	6·7	12
,, ..	203·6	4 54	L. & N.E.R.	G.C. ..	,,	4 42	0 12	4·3	0
Brighton (*l*) ..	50·9	1 00	S.R. ..	L.B. & S.C.	Both	1 00	Nil	0·0	0
Bristol ..	118·3	2 00	G.W.R. ..	—	,,	2 00	Nil	0·0	0
Cambridge (*c*)	56·4	1 14	L. & N.E.R.	G.E. ..	Down	1 11	0 03	4·2	0
Cardiff ..	145·1	2 46	G.W.R. ..	—	,,	2 50	—0 04	—2·3	6
Carlisle ..	299·1	5 50	L.M. & S.R.	L. & N.W.	,,	5 48	0 02	0·6	8
,, ..	309·0	6 23	,,	Midland	Both	6 05	0 18	4·9	0
Chester ..	179·2	3 30	,,	L. & N.W.	Up	3 32	—0 02	—0·9	11
,, ..	195·2	3 53	G.W.R. ..	—	Down	4 13	—0 20	—7·9	29
Edinburgh ..	392·7	7 45(*o*)	L. & N.E.R.	E. Coast	,,	7 45	Nil	0·0	40
,, ..	399·7	8 00	L.M. & S.R.	W. Coast	,,	8 00	Nil	0·0	30
,, ..	407·2	9 16	,,	Midland	,,	8 40	0 36	6·9	5
Eastbourne (*e*)	65·8	1 25	S.R. ..	L.B. & S.C.	,,	1 25	Nil	0·0	5
Exeter ..	173·7	2 59(*p*)	G.W.R. ..	—	Up	3 00	—0 01	—0·6	0
,, ..	171·8	3 19	S.R. ..	L.& S.W.	Down	3 14	0 05	2·6	1
Folkestone (*h*)	70·0	1 20	,, ..	S.E. & C.	Both	1 23(*s*)	—0 03	—3·6	0
Glasgow ..	401·4	8 15	L.M. & S.R.	W. Coast	Down	8 00	0 15	3·1	10
,, ..	424·5	9 05	,,	Midland	Up	8 45	0 20	3·8	0
,, ..	440·0	9 10	L. & N.E.R.	E. Coast	Down	9 20	—0 10	—1·8	35
Halifax (*d*) ..	204·0	4 15	,,	G.N. ..	,,	4 10	0 05	2·0	13
,, (*f*) ..	201·4	4 38	L.M. & S.R.	Midland	,,	4 10	0 28	11·2	0
,, ..	201·8	4 42	L. & N.E.R.	G.C. ..	,,	4 46	—0 04	—1·4	0
,, ..	219·5	4 42	L.M. & S.R.	L. & N.W.	,,	N.S.	—	—	4
Harrogate (*g*)..	203·7	4 00	L. & N.E.R.	G.N. ..	Both	4 00	Nil	0·0	25
,, ..	214·3	4 52	L.M. & S.R.	Midland	,,	4 30	0 22	8·2	— 2
Hastings (*h*) ..	62·4	1 30	S.R. ..	S.E. & C.	Down	1 30	Nil	0·0	0
Hull	196·8	3 53	L. & N.E.R.	G.N. ..	,,	3 52	0 01	0·4	29
Inverness ..	558·4	13 25	,,	E. Coast	,,	13 08	0 17	2·2	30
,, ..	567·8	13 30	L.M.& S.R.	W. Coast	,,	12 53	0 37	4·8	25
Leeds	185·7	3 25	L. & N.E.R.	G.N. ..	Both	3 27	—0 02	—1·0	35
,, ...	196·0	3 55	L.M. & S.R.	Midland	,,	3 40	0 15	6·8	0
Leicester ..	99·1	1 47	,,	,,	Up	1 45	0 02	1·9	0
,, ..	103·1	1 49	L. & N.E.R.	G.C. ..	Down	1 49	Nil	0·0	0
Liverpool (*j*) ..	193·7	3 35	L.M.& S.R.	L. & N.W.	,,	3 35	Nil	0·0	25
Manchester ..	188·5	3 30	,,	,,	Both	3 30	Nil	0·0	28
,, ..	189·9	3 56(*q*)	,,	Midland	,,	3 40	0 16	6·8	0
,, (*k*) ..	206·0	4 23	L. & N.E.R.	G.C. ..	Up	4 10(*t*)	0 13	5·2	2
Margate (*l*) ..	73·9	1 30	S.R. ..	S.E. & C.	Both	1 30	Nil	0·0	0
Newcastle ..	268·3	5 13	L. & N.E.R.	E. Coast	Down	5 13	Nil	0·0	21
Norwich ..	115·0	2 35	,,	G.E. ..	,,	2 26	0 09	6·2	— 1
Nottingham ..	123·5	2 15	L.M. & S.R.	Midland	Both	2 15	Nil	0·0	0
,, ..	126·5	2 16	L. & N.E.R.	G.C. ..	Down	2 23	—0 07	—4·9	0
Parkeston Quay	68·9	1 22	,,	G.E. ..	,,	1 22	Nil	0·0	0
Penzance ..	305·2	6 30	G.W.R. ..	—	,,	6 35	—0 05	—1·3	0
Perth	440·4	9 12	L. & N.E.R.	E. Coast	,,	8 58	0 14	2·6	28
,, ...	449·8	9 12	L.M. & S.R.	W. Coast	,,	9 00	0 12	2·2	23
Plymouth (*m*)..	225·7	4 07	G.W.R. ..	—	,,	4 07	Nil	0·0	0
,, (*m*)..	230·9	5 15	S.R. ..	L. & S.W.	,,	4 56	0 19	6·4	0

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FASTEST TIMES BETWEEN LONDON AND PROVINCIAL TOWNS IN 1914 AND 1923—*continued.*

Town.	Distance from London	Fastest Time, July, 1923.	Railway.	Section.	Direction.	Fastest Time, July, 1914.	Increase, 1914-1923.		Accel. 1923 over 1922.
	miles.	h. m.				h. m.	h. m.	per cent	min.
Portsmouth Tn.	73·6	1 54	S.R. ..	L. & S.W.	Up	1 51	0 03	2·7	3
,, (*l*)	86·8	1 55	,, ..	L.B. & S.C.	Down	1 58	—0 03	—2·6	0
Sheffield ..	164·7	3 06	L. & N.E.R.	G.C. ..	,,	2 57	0 09	5·1	0
,, ..	158·5	3 14	L.M. & S.R.	Midland	Up	3 00	0 14	7·8	0
Scarborough ..	230·2	4 30	L. & N.E.R.	G.N. ..	Both	4 43	—0 13	—4·6	40
Southampton..	79·3	1 32	S.R. ..	L. & S.W.	,,	1 38	—0 06	—6·1	0
Stoke-on-Trent	145·9	2 42	L.M. & S.R.	L. & N.W.	Up	2 41	0 01	0·6	8
Torquay ..	199·7	3 35	G.W.R. ..	—	Both	3 38	—0 03	—1·4	0
Yarmouth ..	121·7	2 30	L. & N.E.R.	G.E. ..	Up	2 30	Nil	0·0	10
York	188·2	3 30	,,	G.N. ..	Both	3 35	—0 05	—2·3	17

(*a*) *Via* Morley. (*b*) Market St., *via* Leeds. (*c*) From St. Pancras. (*e*) From London Bridge. (*d*) *Via* Holbeck. (*f*) *Via* Thornhill. (*g*) *Via* Leeds (Central). (*h*) From Charing Cross. (*j*) Lime St. (*k*) London Rd. (*l*) From Victoria. (*m*) North Road. (*o*) Advertised time, 8 hrs. (*p*) Advertised time, 3 hrs. (*q*) Advertised time, 4 hrs. (*r*) Exchange, *via* Thornhill. (*s*) From Cannon St., 1·2 miles less. (*t*) Central Station, 6·1 miles further. N.S. No through service.

generally and Harrogate, to and from which the greatly accelerated London and North Eastern times are superior to the extent of 23 to 52 min.

By comparison with last year, when they were together at the bottom of the percentage table showing the extent of restoration of services, the sections of the London and North Eastern Railway operating the East Coast Route, and especially the Great Northern, have made by far the greatest strides. Some of the cuts in quickest times have been exceptional —42 min. to Aberdeen, 40 min. to Scarborough, 40 min. to Edinburgh, 35 min. to Glasgow and Leeds, 30 min. to Inverness, 29 min. to Hull, 28 min. to Perth, 21 min. to Newcastle and Bradford, and 17 min. to York; these are excellent figures indeed. The Western Division of the London Midland and Scottish, with the associated Caledonian and Highland sections, is also responsible for some good curtailments of 1922 figures, such as 45 min. to Aberdeen, 30 min. to Edinburgh, 28 min. to Manchester, 25 min. to Liverpool and Inverness, and 23 min. to Perth. Elsewhere by far the most notable cut is that of 29 min. in the fastest Great Western time between Paddington and Chester, by the omission of all stops by one express in each direction between Birmingham and Chester; this is actually 20 min., or 7·9 per cent., better than the best time offered in 1914.

It is instructive to note that the London and North Eastern accelerations of 1923 have made that company the fastest route to all tabulated places in England and Scotland served competitively, with the exception of Glasgow and Manchester, where the handicap of extra distance is too severe, and also Leicester and Nottingham, where the competing company has the advantage of 2 min. in the former case and 1 min. in the latter. The towns reached in shorter time from London than before the war are Bradford (by G.N. route), Cardiff, Chester, Exeter (by G.W.R.), Folkestone, Glasgow (by East Coast route) Halifax (by G.C. route)—and in far less time, of course, by L. & N.W. route, in which case it is, however, hardly fair to offer a percentage figure, as it could not be said that the L. & N.W. offered any service from Euston to Halifax in 1914—Leeds (by G.N. route), Nottingham (by G.C. route), Penzance, Portsmouth Town (by L.B. & S.C. route), Scarborough, Southampton, Torquay and York.

It should be remembered that this table represents the times to and from London only. It is impossible to render in a suitably compressed form corresponding details in respect of the services between the chief provincial cities and towns,

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TABLE B.—RUNS OF 100 MILES OR OVER PERFORMED WITHOUT INTERMEDIATE STOPPAGE.

¶ Railway, Runs between	Distance (Miles).	Daily Runs (No.)	Other Runs (No.)	Fastest. Train.	Time (min.)	Speed m.p.h.	Total No. of Runs Daily. 1923.	1914.
L.M. & S.Rly.							68	60
L. & N.W. Section (209·1)							52	41
Euston-Colwyn Bay ..	219·5	—	1 (*a*)	11.15 a.m., D (*a*)	258	51·0		
Euston-Prestatyn ..	205·5	1	—	11.15 a.m., D ..	239	51·6		
Euston-Edge Hill (L'pool)	192·3	1	1 (*b*)	5.55 p.m., D ..	213	54·2		
Euston-Chester	179·2	—	1 (*c*)	8.45 p.m., D (*c*)	213	50·5		
Euston-Wilmslow ..	176·9	2	—	10.08 a.m. U ..	187	56·8		
Crewe-Broad St.	162·4	1 (*d*)	—	11.44 p.m., U (*d*)	216	45·1		
Prestatyn-Bletchley ..	158·8	1	—	12.50 p.m., U ..	188	50·7		
Euston-Crewe	158·1	10	2 (*e*)	11.00 p.m. D (*h*)..	169	56·0		
Crewe-Willesden Jc. ..	152·7	2	2 (*c*)	3.46 a.m., U ..	170	53·9		
Harecastle-Willesden Jc.	146·7	—	1 (*f*)	9.46 p.m., U (*f*) ..	175	50·3		
Stoke-on-Trent-Euston ..	145·9	1	—	1.13 p.m., U ..	162	54·0		
Camden-Stoke-on-Trent*	145·7	1 (*d*)	—	9.35 p.m., D (*d*)	240	36·4		
Crewe-Carlisle	141·0	15	3 (*e*)	1.07 p.m., D ..	163	51·9		
Stoke-on-Trent-Willesden	140·5	1 (*h*)	—	12.26 a.m., D (*h*)	195	43·2		
Euston-Stafford	133·6	5	—	3 trains D and U	146	54·9		
Euston-Birmingham ..	112·9	5	—	5 trains D and U	120	56·5		
Crewe-Bletchley	111·4	—	1 (*g*)	1.47 p.m., U (*g*)	129	51·8		
Rugby-Wigan	111·3	1	—	1.11 p.m., D ..	127	52·6		
Edge Hill-Rugby.. ..	109·7	1 (*d*)	—	11.15 a.m., U (*d*)	165	39·9		
Camden-Tamworth ..	108·4	1 (*d*)	—	9.50 p.m., D (*d*)	183	35·6		
Birmingham-Willesden Jc	107·5	1	—	4.50 p.m., U ..	109	59·2		
Crewe-Holyhead	105·5	—	2 (*g*)	11.40 a.m., D (*g*)	130	48·8		
Wigan-Carlisle	105·2	2	2 (*e*)	12.26 a.m., D ..	124	50·9		
Birmingham-Prestatyn ..	100·7	—	1 (*g*)	12.55 p.m., D (*g*)	156	38·7		
Midland Section (206·0)							10	15
St. Pancras-Nottingham	123·5	4	—	4 trains D and U	135	54·9		
St. Pancras-Trent Jc. ..	119·8	2	—	5.40 a.m., U ..	130	55·3		
Leeds-Carlisle	113·0	4	—	3.53 a.m., D 4.07 p.m., D	135	50·2		
Caledonian Section (111·0)							6	4
Beattock-Perth	111·0	2	—	2.20 a.m., D 2.30 a.m., D	142	46·9		
Carlisle-Glasgow	102·3	3 (*l*)	—	10.00 a.m., U ..	134	45·8		
Edinburgh-Carlisle ..	100·6	1	—	10.00 a.m., U ..	120	50·3		
L. & N.E.Rly.							51	41
G.N. Section (175·7)							25	22
King's Cross-York ..	188·2	2	—	11.50 a.m., D 4.00 p.m., U	210	53·8		
Leeds-King's Cross ..	185·7	1	—	11.50 a.m., U ..	205	54·4		
King's Cross-Holbeck ..	185·2	1	—	11.15 a.m., D ..	202	55·0		
King's Cross-Doncaster ..	156·0	3	—	11.40 p.m., D	174	53·8		
King's Cross-Grantham ..	105·5	16	2 (*g*)	9.36 a.m., U ..	114	55·5		
Grantham-Finsbury Pk.	103·0	2 (*m*)	—	10.11 p.m., U (*m*)	129	47·9		

(*a*) First portion of 11.15 a.m. down, Saturdays only. (*b*) Conditional boat timing. (*c*) First portion of 8.50 p.m. Irish Mail when divided. (*d*) Fish train. (*e*) Excursion trains, Fridays or Saturdays only. (*f*) Parcels train. (*g*) Relief trains, Saturdays only. (*h*) Newspaper train. (*k*) Perishable trains. (*l*) Include conditional stops in all cases. (*m*) Milk trains. ¶ Figures in brackets in this column indicate longest run (miles) in 1914. D—down. U—up. * Grange Jc.

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TABLE B.—RUNS OF 100 MILES OR OVER PERFORMED WITHOUT INTERMEDIATE STOPPAGE—*continued*.

¶Railway, Runs between	Distance (Miles).	Daily Runs (No.)	Other Runs (No.)	Fastest Train.	Fastest Time (min.)	Fastest Speed m.p.h.	Total No. of Runs Daily. 1923.	1914.
N.E. Section (124·4)							14	8
Grantham-Darlington ..	126·8	1	—	7.31 p.m., D ..	142	53·6		
Newcastle-Edinburgh ..	124·4	12	1 (*g*)	5 trains, D ..	144	51·8		
Doncaster-Newcastle ..	112·4	1	—	2.39 a.m., D ..	140	48·2		
G.E. Section (130·2)							6	7
Liverpool St.-N. Walsham	130·2	2	—	12.25 p.m., D ..	159	49·1		
Liverpool St.-Yarmouth	121·8	2	—	12.30 p.m., U ..	150	48·7		
Liverpool St.-Beccles ..	109·2	2	—	9.55 a.m., D ..	146	44·9		
G.C. Section (164·7)							5	4
Marylebone-Leicester (*n*)	107·6	1	—	6.20 p.m., D ..	114	56·6		
Marylebone-Leicester (*o*)	103·1	4	—	3.20 p.m., D ..	109	56·8		
N.B. Section (98·2)							1	—
Edinburgh-Newcastle ..	124·4	1	—	11.05 p.m., U ..	155	48·2		
G.W.Rly. (225·7)							27	33
Paddington-Plymouth ..	225·7	1	—	10.30 a.m., D ..	247	54·8		
Paddington-Brent ..	209·4	—	1 (*g*)	11.00 a.m., D (*g*)	230	54·6		
Paddington-Torquay ..	199·7	2	—	12.00 noon, D 12.10 p.m., U	215	55·7		
Paddington-Newton Ab't.	193·9	—	1 (*g*)	3.25 p.m., U (*g*)	221	52·7		
Paddington-Exeter ..	173·7	3	—	1.46 p.m., U ..	179(*u*)	58·2		
Reading-Newton Abbot	157·9	—	3 (*e*)	9.08 a.m., D (*e*)	185	51·2		
Paddington-Taunton ..	142·9	2	1 (*s*)	3.30 p.m., D (*s*)	148	57·9		
Reading-Exeter	137·7	1	3 (*e*)	1.25 p.m., U ..	145	57·0		
Paddington-Newport ..	133·4	5	—	11.50 a.m., D (*t*)	150 (*t*)	53·4		
Plymouth-Bristol ..	127·6	—	1 (*g*)	1.40 p.m., U (*g*)	169	45·3		
Exeter-Cheltenham ..	120·9	—	1 (*g*)	2.46 p.m., U (*g*)	148	49·0		
Paddington-Worcester ..	120·5	1	—	1.30 p.m., D ..	130	55·6		
Shrewsbury-Bristol (*p*) ..	120·5	—	1 (*e*)	11.18 p.m., D (*e*)	187	38·7		
Paddington-Bristol (*q*) ..	118·3	2	—	11.15 a.m., D 1.00 p.m., D	120	59·2		
Bristol-Paddington (*r*) ..	117·6	2	—	12.00 noon, U 5.00 p.m., U	120	58·8		
Paddington-Birmingham	110·6	4	—	4 trains, D and U	120	55·3		
Paddington-Bath ..	106·9	3	2 (*s*)	11.15 a.m. D(*s*) 1.00 p.m. D (*s*)	105	61·1		
Reading-Taunton ..	106·9	1	4 (*es*)	11.00 a.m., U (*s*)	112	57·3		
Newton Abbot-Trowbdge.	102·3	—	1 (*e*)	1.02 p.m., U (*e*)	123	49·9		
Southern Rly. (L. & S.W. Section—108·0)							0	4
GRAND TOTALS							146	138

(*n*) *Via* Wycombe. (*o*) *Via* Aylesbury. (*p*) Pylle Hill Jc., Bristol. (*q*) *Via* Bath. (*r*) *Via* Badminton. (*s*) By slip coach. (*t*) Faster service by 8.00 p.m., D (147 min.=54·5 m.p.h.), calling at Reading. (*u*) Advertised time, 180 min. ¶ Figures in brackets in this column indicate longest run (miles) in 1914. D—down. U—up.

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TABLE C.—LONGEST DAILY NON-STOP RUNS IN 1923 ON RAILWAYS HAVING NO RUNS EXCEEDING 100 MILES.

Railway.	Runs Between	Distance	No. of Runs	Fastest Time.	Fastest Train.	Speed.	Longest Run in 1914.
		Miles.		Min.		m.p.h.	Miles.
L.M. & S. (G. & S.W. Sec.)	Kilmarnock-Carlisle ..	91·1	1	113	11.24 p.m. U	48·4	91·1
Southern—							
(L. & S.W. Sec.) ..	Salisbury-Exeter ..	88·0	4	101	*12.40 p.m.D	52·3	108·0
(L.B. & S.C. Sec.) ..	Victoria-Fratton ..	84·4	2	110	†11.35 a.m.D	46·0	84·4
(S.E. & C. Sec.) ..	Victoria-Dover Marine	78·0	9	100	‡10.50 a.m. D	46·8	78·0
L.M. & S. (Highland)..	Perth-Newtonmore ..	‖68·8	1	117	11.55 a.m. D	‖35·3	68·8
S. & D. Joint C'ttee...	Bath-Broadstone Jc. ..	‖63·9	2	93	10.47 a.m. U	‖41·1	67·1
L. & N.E. (G.N.S. Sec.)	Dufftown-Schoolhill ..	††63·7	1	80	‡‡9·08 p.m. U	‡‡47·7	63·7
N.C.C. (Ireland) ..	Greenisland-Portrush ..	‖60·8	2	83	8.00 p.m. U	‖44·0	46·5
G.N.R. (Ireland) ..	Dublin-Dundalk ..	54·3	1	64	3·00 p.m. D	50·9	33·3
G.S. & W.R. (Ireland)	Maryborough-Dublin ..	51·0	1	70	6.30 p.m. U	43·7	86·8
M.G.W.R. (Ireland) ..	Dublin-Mullingar ..	50·3	5	74	6.06 p.m. U	40·8	50·3
Cheshire Lines C'ttee.	Godley Jc.-Liverpool ..	42·8	1	58	5.39 p.m. U	44·3	37·3
B. & C.D. (Ireland) ..	Belfast-Newcastle ..	‖38·0	2	55	§ 12.00 noonD	‖41·5	38·0
M. & G.N. Joint C'ttee.	Bourne-South Lynn ..	‖34·0	3	50	¶2.20 p.m. D	‖40·8	71·3

‖ Mainly single line. †† Partly single line. D—Down. U—Up. ‡‡ Wednesdays and Saturdays only. * And at 4.38 p.m., D, and 12.30 p.m., U. † And at 1.35 p.m., D. ‡ And at 11.00 a.m. and 2.00 p.m., D. § And at 5.35 p.m., U; Saturdays only in both directions. ¶ And at 1.21 p.m., U.

though in many cases these are now restored to the pre-war level in speed. The restoration has not, however, been so general as yet as in the case of the chief services focused upon the Metropolis, and in some instances, such as the West Coast services between Liverpool, Manchester and Scotland, and Glasgow up to Aberdeen, the post-war times are distinctly inferior to those of pre-war days. At the same time there has been a marked increase in the facilities for cross-country travel. Here, again, it would be instructive if details could be given in tabular form of the cross-country services and times at present operating; not only have many new cross-country trains been run during the past summer, such, for example, as the L.M. & S. corridor luncheon train (in competition with the corresponding L. & N.E. service *via* the G.C. and G.E. route) between Liverpool and Lowestoft, but divisions and accelerations of certain previously existing services have led to some quite noteworthy cross-country schedules. Here the Great Western Railway figures prominently, with a non-stop run of 127½ miles from Plymouth to Bristol, and another of 121 miles from Exeter to Cheltenham.

This brings me to Table "B," which details the 100-mile runs operating in the summer of 1923. Here we have, at long last, an advance over the pre-war totals in respect of runs made every day. Top place in regard to numbers goes to the London Midland and Scottish Railway, and the chief honours, without question, rest with the Western Division—best known as the London and North Western—which increases its own individual total by no less than 53 per cent. over the figures of last year. This has been done chiefly by the cutting out of all the intermediate stops for changing train-crews and other working purposes, which have been operating hitherto in the schedules of a number of trains nominally non-stop over long distances, especially on the Crewe and Carlisle section. Thus the daily non-stop runs over the 141 miles between these two important stations alone increase from 8 to 15; the succession of up night trains—at 12.5, 12.13, 12.42, 12.57, 1.10, 1.20 and 1.45 a.m. from Carlisle—which all make this non-stop break

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within the confines of 1¾ hours, is almost unique over such a course as this. It gives some conception, at least, of the tremendous extent of the Scottish night traffic of to-day. In the reverse direction the corresponding non-stop night trains, five in number—with two more nightly non-stop from Wigan to Carlisle—are spread out over a little more than four hours.

A good many readers will be interested to see that the 205½ miles run from Euston to Prestatyn does not represent the longest non-stop journey undertaken by the L.M. & S. Company, as on Saturdays during the height of the season this train is divided, and the first portion makes Colwyn Bay without a halt, 14 miles further, and only a little over six miles behind the record flight of the Great Western Cornish Riviera express to Plymouth. Euston to Edge Hill, Liverpool, reappears in its pre-war timing, but the present schedule includes a conditional stop at Mossley Hill when the express is required to set down. After the Euston-Chester booking of the first portion of the 8.50 p.m. down Irish Mail, when that train is divided, we then have the Euston-Wilmslow bookings, now two instead of the one of last year, and with a faster up schedule than this express ever had in pre-war days, owing to an increased stopping allowance at Wilmslow for making up the train. The best Euston-Crewe timing betters pre-war figures by 2 min., and is a train conveying newspapers only; the best up timing—the 170 min. of the 5.20 p.m.

TABLE D.—FASTEST RUNS ON LEADING RAILWAYS IN 1914 AND 1923.

Railway.	Section.	In July, 1923.						In 1914 ¶
		Train.	From—	To—	Distance.	Time.	Speed.	Speed.
					Miles.	Min.	m.p.h.	m.p.h.
G.W.R. ..	—	3.45 p.m. ..	Swindon ..	Paddington	77·3	75	61·8	61·1
L. & N.E.R.	N.E. ..	8.59 p.m. ..	Darlington	York ..	44·1	43	61·5	61·5
,,	G.C. ..	4.30 a.m. ..	Leicester ..	Arkwright St., Notts.	22·6	22	61·5	61·5
L.M. & S.R.	L. & N.W.	1.00 p.m. (*a*)	Birmingham	Coventry ..	18·9	19	59·7	57·7
,,	Caledonian	4.43 p.m. ..	Forfar ..	Perth ..	32·5	34	57·4	57·4
,,	Midland ..	6.41 p.m. ..	Kettering ..	St. Pancras	72·0	76	56·8	56·8
Southern R.	S.E. & C. ..	6.00 p.m. ..	Tonbridge	Ashford ..	26·5	28	56·8	54·8
L. & N.E.R.	G.N. ..	7.39 p.m. (*b*)	Grantham	Doncaster	50·5	54	56·1	57·5
Southern R.	L. & S.W.	7.56 a.m. ..	Dorchester	Wareham ..	14·8	16	55·5	57·2
G.N.R. (I) ..	—	9.12 a.m. ..	Adavoyle ..	Dundalk ..	8·2	9	54·7	50·0
Cheshire L. C.	—	8.30 a.m. (*c*)	Manchester	Warrington	15·7	18	52·3	52·3
L. & N.E.R.	G.E. ..	10.19 p.m.	Shenfield ..	Prittlewell	20·7	24	51·8	52·9
Southern R.	L.B. & S.C.	7.12 p.m. ..	Horsham ..	Arundel ..	20·6	24	51·5	50·9
L. & N.E.R.	N.B. ..	5.45 p.m. ..	Polmont ..	Lenzie (*h*)	18·7	22	51·0	52·3
L.M. & S.R.	G. & S.W...	5.10 p.m. (*d*)	Glasgow ..	Ayr ..	41·4	50	49·7	54·6
L.M. & S.R.	L. & Y. ..	4.47 p.m. ..	Hellifield ..	Chatburn ..	11·6	14	49·7	54·7
L. & N.E.R.	G.N.S. ..	1.00 p.m. (*e*)	Aberdeen ..	Auchindachy (*k*)	56·8*	71	48·0	46·4
G.S. & W.R. (Ireland)	—	6.47 p.m.	Kildare ..	Dublin ..	30·0	38	47·4	51·9
M. & G.N.J.R	—	10.11 a.m.(*f*)	Melton ..	Drayton ..	16·8*	22	45·7	45·7
S. & D.J.R.	—	12.25 p.m.	Blandford	Evercreech Jc.	26·4*	35	45·2	46·6
L. M. & S.R.	N.C.C. (1) ..	12.29 p.m. (*g*)	Greenisland	Portrush ..	60·8*	81	45·0	47·3
L.M. & S.R.	Highland ..	11.08 a.m...	Blair Atholl	Perth ..	35·3*	48	44·1	41·5
B. & C.D.R. (Ireland)	—	5.40 p.m. ..	Belfast ..	Crossgar ..	21·3*	29	44·1	44·1
M.G.W.R. (Ireland)	—	6.06 p.m. ..	Mullingar ..	Dublin ..	50·3	74	40·8	40·8

(*a*) And at 4.58, 6.20 and 8.20 p.m. (*b*) And at 7.52 p.m. (*c*) And at 15 other times daily. (*d*) And at 8.25 a.m., Ayr-Glasgow. (*e*) Wednesdays and Saturdays only. (*f*) And at 4.13 and 6.37 p.m. (*g*) Saturdays only. (*h*) Conditional stop. (*k*) Working stop to cross train on single line. * Majority of distance single line. ¶ Generally, but not in all cases, over same route.

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TABLE E.—RESTAURANT AND PULLMAN CAR TRAINS, 1923.

Railway.	Section.	Restaurant Car Workings.	Pullman Restaurant Cars. ¶	Pullman Car Workings.	Buffet Tea-Car Workings.	Totals.
L. M. & S.R.	L. & N.W. ..	79	—	—	10	89
	Midland ..	57	—	—	—	57
	Caledonian ..	—	22	18	—	40
	Highland ..	4	4*	—	—	8
	L. & Y. ..	6	—	—	—	6
	G. & S.W. ..	2	4	—	—	6
	" Foreign "† ..	7	—	—	—	7
L.M. & S.R.	Totals ..	155	30	18	10	213
L. & N.E.R.	G.E.	42	—	27‡	—	62‖
	G.N.	29	—	2	—	31
	G.C.	20	—	—	—	20
	N.B.	17	—	—	—	17
	N.E.	13	—	§	—	13
	G.N.S. ..	2	—	—	—	2
	" Foreign "†	10	—	—	—	10
L. & N.E.R.	Totals ..	133	—	29‡	—	155
Southern R.	L.B. & S.C. ..	—	—	56	—	56
	L. & S.W. ..	38	—	—	8	46
	S.E. & C. ..	—	—	44	—	44
	" Foreign "†	8	—	—	—	8
Southern R.	Totals ..	46	—	100	8	154
G.W.R.	G.W. ..	80	—	—	5	85
	Cambrian ..	—	—	—	1	1
	" Foreign "†	15	—	—	—	15
G.W.R.	Totals ..	95	—	—	6	101
Irish Railways.. ..	G.N.R. ..	4	—	—	6	10
	M.G.W.R. ..	2	—	—	—	2
	D. & S.E.R.	2	—	—	—	2
Irish Railways.. ..	Totals ..	8	—	—	6	14
Metropolitan Railway..	Extension ..	—	—	8	—	8
GRAND NET TOTALS†	.. .. ..	397†	30	155	30	605

* Also two through workings to and from Caledonian Section, Glasgow-Aviemore-Glasgow. § Also two through workings to and from G.N. Section, King's Cross-Newcastle-King's Cross. ‡ Includes seven trains in which Pullman and restaurant cars run independently in same train formation throughout journey. ‖ Net total trains equipped with cars. ¶ Ordinary restaurant cars (without supplementary seat charge) operated by Pullman Co. † These totals do not include the same cars twice, when run over more than one system.

from Liverpool to London—is well above the best pre-war figure.

A reflection prompted by this table is the remarkable treatment meted out nowadays to goods traffic; the North Western total alone includes seven nightly 100-mile runs monopolised by trains conveying parcels, fish and perishable traffic. One of the fish trains—the 8.20 p.m. from Carlisle—follows a break of 141 miles from Carlisle to Crewe with another of 161½ miles from Crewe to Broad Street, doing the whole journey of just over 300 miles in seven hours—almost a case of "*flying* fish," indeed! The runs of parcels trains over distances of nearly 150 miles non-stop—Camden-Stoke, Stoke-Willesden and Harecastle-Willesden—are

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also very creditable, the last-named being actually booked at a throughout average of over 50 m.p.h.

If the Great Western Railway does not take highest place in the number of its runs, it can certainly boast the longest break, as well as the best all-round quality in the matter of speed. Ten of its items are scheduled at speeds of 55 m.p.h. and over, as compared with nine only in the case of all the other railways in the table put together. That ten, again, would be 12, but for the formidable obstacles put in the way of speed by the mountainous grades between Newton Abbot and Plymouth; this brings the average overall speeds of the 10.30 a.m. and the Saturday 11 a.m. down expresses just below the 55 mark, although they are both 3-hour trains to passing Exeter, which means an average to that point of 58·2 m.p.h. Comment may again be directed towards the excellent fare served out nowadays to the excursionist—and this applies with equal force to almost all the leading main lines—three runs of 158 miles, two of 137¾ miles, one of 120½ miles, and four more between 100 and 110 miles, being amongst the good things of the G.W.R. excursion programme, in each case once weekly, of course. A point concerning the Paddington-Newport non-stop runs is that in both directions they are bettered in time by expresses calling at Reading—*i.e.*, the 8.45 a.m. and 8 p.m *ex*-Paddington, and their corresponding up trains.

Out of the London and North Eastern total of 51 runs, which finds a place midway between the Great Western and London Midland and Scottish totals, no less than 16 are run between King's Cross and Grantham, and 12 more between Newcastle and Edinburgh. Of the latter I have quite properly credited one to the North British section—the first 100-mile run for which that system has ever been responsible, seeing that a North British "Atlantic" now nightly works the 11.5 p.m. express (7.35 p.m. from Aberdeen) from Edinburgh down to Newcastle. A

TABLE F.—SLEEPING CAR SERVICES TO AND FROM LONDON IN 1914 AND 1923.

Railway.	Division.	Destination of Independent Services (figures in brackets indicate services in each direction daily).	Total. 1923	Total. 1914
L.M. & S.R.	West Coast	Glasgow (4), Dundee (4), Inverness (2), Inverness *via* Forres (2), Aberdeen (2), Lossiemouth (2), Oban (2), Stranraer (2), Edinburgh (2), Holyhead (2), Liverpool (2), Manchester (2). Also Liverpool-Glasgow (2) and Glasgow-Inverness (2)	32	34
	Midland ..	Glasgow (4), Edinburgh (2)	6	14
		Total ..	38	48
L. & N.E.R.	East Coast	Inverness (2), Inverness *via* Forres (2), Lossiemouth (2), Aberdeen (2), Fort William (2), Perth (2), Glasgow (2), Edinburgh (2), Newcastle (2), Dundee (1), Montrose (1). Also Aberdeen-Penzance (2)	22	12
G.W.R. ..	—	Penzance (2), Plymouth (2), Neyland (2), Birkenhead (1), Shrewsbury (1)	8	8
		Grand total ..	68	68
		COMBINED SLEEPING AND RESTAURANT CAR SERVICES.		
L. & N.E.R.	—	Dining Car Trains (6), Breakfast Car Trains (4) ..	10	1
L.M. & S.R.	—	Dining Car Trains (5), Breakfast Car Trains (3) ..	8	4
G.W.R. ..	—	Nil	—	2
		Grand total ..	18	7

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TABLE G.—SLIP COACHES IN 1914 AND 1923.

Railway.	Section.	Where detached (number daily in brackets).	Total Number detached. 1923	1914
G.W.R. ..	—	Reading (9), Westbury (4), Banbury (3), Bridgwater (3), Leamington (3), Bicester (2), Bath (2), Chippenham (2), Princes Risborough (2), Stoke Gifford (2), Taplow (2), Twyford (2), Kingham (1), Maidenhead (1), Moreton-in-Marsh (1), Newbury (1), Swindon (1), Taunton (1), Warwick (1), Wellington (1), also [Hatton, Saturdays only (1)]	44	70
Southern R.	L.B. & S.C.	Hayward's Heath (6), Polegate (4), Preston Park (4), Barnham Jc. (2), Ashurst (1), Croydon (1), Horley (1), Sutton (1), Three Bridges (1)	21	21
	S.E. & C. ..	Ashford (3), Faversham (3), Swanley (2), Herne Hill (1)	9	8
L.M. & S.R.	L. & Y. ..	Accrington (2), Blackburn (1), Midge Hall (1), Rochdale (1), Todmorden (1)	6	7
	L. & N.W.	None	—	16
	Midland ..	None	—	18
	Caledonian	None	—	10
L. & N.E.R.	G.C. ..	Finmere (1), Brackley (1)	2	4
	G.E. ..	Waltham Cross (1), Broxbourne (1)	2	14
	G.N. ..	None	—	1
Irish Rlys. ..	G.N.R. ..	Drogheda (1), Goraghwood (1), Lisburn (1)	3	—
	M.G.W.R. ..	Enfield (1)	1	1
	G.S. & W.R.	None	—	6
	B. & C.D. ..	None	—	1
Totals	.. ..	.. ..	88	177

nightly non-stop schedule for horse and carriage traffic and empties, in 153 min., is included; it is also of note that the fastest booking between these points—144 min.—is performed by a quick succession of no less than five down night expresses. Another peculiarly interesting first-fruit of grouping is found in the working by the North Eastern section of a non-stop run daily from Grantham through to Darlington.

To the programme of the Great Northern section, which, by the way, is itself responsible for only two journeys less daily than the Great Western, distinction is lent by the lengthy runs between London and Leeds and London and York respectively, both being longer than has ever been attempted previously, as a regular performance, on the G.N.R. Two express milk trains again figure in the Great Northern list, as between Grantham and Finsbury Park, a nightly trip in both cases. The Great Eastern and Great Central sections reproduce last year's totals, with some acceleration in the former case, the London-North Walsham time being now within 1 min. of the pre-war schedule, and the up Yarmouth non-stop time right down to the 150 min. of pre-war days.

Reverting to the London Midland and Scottish figures, we notice that the Midland Division adds a new Nottingham-St. Pancras run, and the Caledonian Section reinstates two of the nominally non-stopping trains from Carlisle to Perth, actually non-stop from Beattock or Summit to Perth, according to whether they are banked from Beattock or piloted from Carlisle throughout to Summit respectively. Nearly all the down trains make this stop, and even the three Glasgow-Carlisle runs shown in the table are so liberally provided with conditional stops that to make an actual non-stop run is a comparatively infrequent occurrence. The Southern Railway does not figure in the table, the Bournemouth runs of the London and South Western section not having yet been reinstated, and this is the only failure to reproduce a pre-war appearance among the "100-

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mile " lines; but, despite this, as previously mentioned, the grand total of runs is now above the pre-war figure, chiefly owing to the large increase this year in the number of runs on what were the London and North Western, Great Northern and North Eastern lines.

In Table C are shown the longest efforts of lines which do not attain to the 100-mile standard. There is no change to speak of as regards the first four lines shown, but later on there come some highly creditable achievements on the part of some of the smaller sections of the large groups, and also by joint lines, four runs in particular over distances between 60 and 70 miles being over what is almost entirely single line track.

Table D presents a list of the fastest runs in force over the various railways, both the divisions of the large groups and the Irish lines, as heretofore, as well as the fastest performances over the joint lines and smaller railways. In this table the most notable change, of course, is the movement of the Great Western Railway to the top place in the table, for the first time in its history. The Great Western is justly entitled to be proud of the fact that it has, on the basis of figures already given, made the finest post-war recovery in speed; that it is responsible for both the fastest run and the longest non-stop run in the country, the Empire, and probably the world; not to mention such a minor record as the largest number of slip coach services.

In their order the next four places are unchanged, after which the Midland Division of the L.M. & S., by cutting a minute off the Kettering-St. Pancras time, reverts to pre-war best and moves " up one." The S.E. & C. section of the Southern Railway is again found in a high place by what is by no means an isolated high speed effort over that progressive railway, and is closely followed by the Great Northern section of the L. & N.E.R.—in the same position as last year, but showing a higher start-to-stop speed owing to the acceleration by a minute of the Grantham-Doncaster " snippet." The L. & S.W. section of the Southern also maintains position, but increases speed by the curtailment to 16 min. of one of the downhill journeys over the 14·8 miles from Dorchester to Wareham. The Great Northern of Ireland reinstates a precisely similar but even shorter sprint from Adavoyle down to Dundalk, but the Brighton section of the Southern drops below the Cheshire Lines Committee, on account of the 46-min. Brighton-Croydon journey being decelerated to 47 min., so that another smart effort, from Horsham to Arundel, now takes first place on that line.

After that comes a remarkable sequence of six runs, all for part of their length, or in some cases the whole distance, over single line track; yet the booked overall speeds range from 44 to 48 m.p.h., showing what remarkable progress has been made in the laying out of passing loops, fully equipped with automatic tablet-exchanging apparatus, suitable for negotiation at speeds up to a mile-a-minute or so. The Great North of Scotland effort is a revival of the half-day Speyside excursion from Aberdeen twice weekly. Booked speeds on the Great Southern and Western Railway of Ireland have suffered a serious temporary decline, but this is not to be wondered at in view of the devastation suffered in the distressful area served by that line, which will take some considerable time to repair. Concerning the table as a whole, it is a healthy sign that nine lines can show runs at speeds exceeding 55 m.p.h., as against eight in 1914; the average of all the booked speeds (excluding the G.S. & W.R., which is not a fair comparison in the circumstances) is 52·2 m.p.h. in 1923, as against 50·7 m.p.h. in 1914, which shows quite a fair increase.

In Table E we have a summary of the restaurant and Pullman car services operating in the summer of this year. This I have had to recast altogether, owing to the grouping, and no comparison is possible with pre-war figures, as this time I have confined the figures for each group division to the services for the manning of which that division is actually responsible, the East Coast services, for example, going to the Great Northern section of the L. & N.E.R., the West Coast to the L. & N.W. section of the London Midland and Scottish, the M. and G. & S.W. and M. & N.B. cars to the Midland Division of the L.M. & S., and so on. This makes some of the individual totals appear somewhat smaller than before, but the grand total, which is now a straightforward sum of

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the individual totals (excepting only "foreign" workings, which obviously are not counted a second time) for the first time exceeds the extraordinary figure of 600 daily services in the British Isles. By "service" is meant each separate working of a car or cars, the two cars on the 10 a.m. ex-Euston, for example, being counted as two services, seeing that the train concerned divides at Crewe into two independent trains, each restaurant-car equipped; while a return service out and home over the same route in the day equally counts as two trips. Only in cases where independent cars run throughout on the same train are the two cars counted as one in the aggregate. So much for the method of compiling the table.

The Great Western Railway achieves considerable distinction in that, for the first time, the total of workings over that system, including "foreigners," tops the one-hundred mark. Including buffet tea-car workings, however, the self-operated. London and North Western total, which I have separated this year from the L. & Y. figures, is greater by four than the corresponding Great Western total. Of the other railway divisions, the Great Eastern section of the L. & N.E.R. goes one better than even its remarkable figures of 1922, more than doubling the totals of any other section of that group, and again taking third place among the individual lines in the table, well above the Midland, which comes next.

Among the chief developments of 1923 may be mentioned the extension of restaurant car facilities to the regions "Farthest North," cars working daily from Inverness to both Bonar Bridge and Helmsdale and back; an increase to three in each direction of the Pullman dining-car workings between Perth and Aviemore; new Pullman car workings between Glasgow and Ayr, over the G. & S.W. route, and Glasgow and Peebles; the through working of L. & N.W. dining cars to Aberystwith, and from Liverpool to Lowestoft; a considerable increase in Pullman car workings on the S.E. & C. section of the Southern Railway, the Hastings cars, in particular, being put on too late last year to figure in the 1922 tables; and, of course, the famous new "Pullman Limited" over the G.N. and N.E. sections of the L. & N.E.R., between London, Leeds, Harrogate and Newcastle, which has, I believe I am right in saying, proved exceptionally successful for so entirely novel a departure from previous practice. It will be seen from these remarks that the principal part of the increase of 56 services over last year's figures has been due to the enterprise of the Pullman Car Company, the number of Pullman car trains alone having gone up from 153 to 185 daily in this country.

The grand total of services rose from 475 in 1914 to 556 in 1922, and in 1923 it increases further to the perfectly astounding aggregate of 605 daily Pullman or restaurant car trains in these islands. Such is the tribute, both to the consideration of British railway companies for the comfort of their clients, and also to the wonderful popularity of the travelling restaurant with the travelling public. Beyond the fact that the workings of the cars of one division of a group over other divisions can hardly be regarded any longer as "foreign" workings, the changes in the working of cars over lines other than those of the owners are this year so slight as compared with last year, that I have not considered it necessary to prepare again the table concerned; readers desiring this information should refer to the October issue of 1922.

Sleeping-car service totals are given in Table F, in a rather more detailed form than last year. Considerably more than full pre-war services have now been restored on the London and North Eastern system, but the London Midland and Scottish totals are still reduced by the withdrawal of so many of the Midland services. This summer's special additions consisting of through cars from King's Cross and Euston to both Lossiemouth, and also Inverness *via* Forres, from Aberdeen to Penzance by the London and North Eastern route, and from Paddington to Birkenhead by G.W.R. There has also been a substantial increase in the number of expresses conveying both restaurant and sleeping cars in their formations. Three such trains now go nightly out of King's Cross and Euston, carrying restaurant cars to Grantham, York and Crewe; breakfast cars are provided from Perth to Inverness in connection with the same services, and

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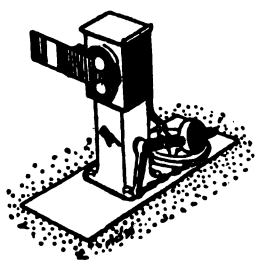
also from Carlisle to Glasgow by both Caledonian and G. & S.W. routes, from Carstairs to Perth, and from Edinburgh to Glasgow and Aberdeen, in connection with five other of the night services. Five only out of these eleven restaurant car services, in connection with the sleeping car trains, ran in 1914, and were in all cases the breakfast services last referred to; dining-car services out of London, now so well patronised and appreciated, had not been thought of, apparently. Similar restaurant-car dining accommodation is provided in the opposite direction, but not breakfast cars, the hour of arrival in London being somewhat too early for the latter. A novelty in this year's arrangements is, however, the serving of light refreshments from York to London on the night express due in King's Cross at 6.50 a.m.; this is done from a restaurant car, as a return working of the car which runs to York on the 7.45 p.m. Highland express out of London.

Our final consideration, in Table G, is that of slip-coach services. For reasons often previously explained, these are not likely again to reach pre-war figures, especially as the Midland, London and North-Western and Caledonian Divisions of the London Midland and Scottish system, all of which were extensive slip-coach users prior to the war, have now abandoned the practice entirely, this fact alone accounting for a drop of 45 in the total figures. The slips on the Great Eastern section of the L. & N.E.R. have also shrunk in number from 14 in 1914 to two in 1923.

There are some additions to the list to chronicle this year, however; the Great Western Railway, as usual, is well to the fore, having added two new slip workings at Stoke Gifford (off South Wales expresses, for Bristol), and one each at Chippenham, Leamington, Princes Risborough, Taunton, Warwick, Wellington and Westbury; one slip at Didcot has been abandoned in view of the division of the train (8.45 a.m. down) concerned. The South Eastern and Chatham section of the Southern Railway has added two new slips at Ashford and one at Faversham, but the Brighton has dropped one of those operating last year, at Ashurst. The Great Central section of the L. & N.E.R. now has two slips instead of one last year, having tacked a Finmere slip coach on to the back of the Woodford slip already carried by the 6.20 p.m. down Bradford express. In this way the slip-coach services operating in the British Isles have been brought up to almost exactly one-half the number that was detached daily in 1914. Reading has the distinction of being the most "slip-patronised" station, with nine slips daily, and Hayward's Heath follows with six each day.

Much more might be written concerning the summer services of 1923, did considerations of space permit, but the foregoing may be sufficient to prove that the present year has witnessed some of the most marked developments in the speed and comfort of British travel that British railway history records.



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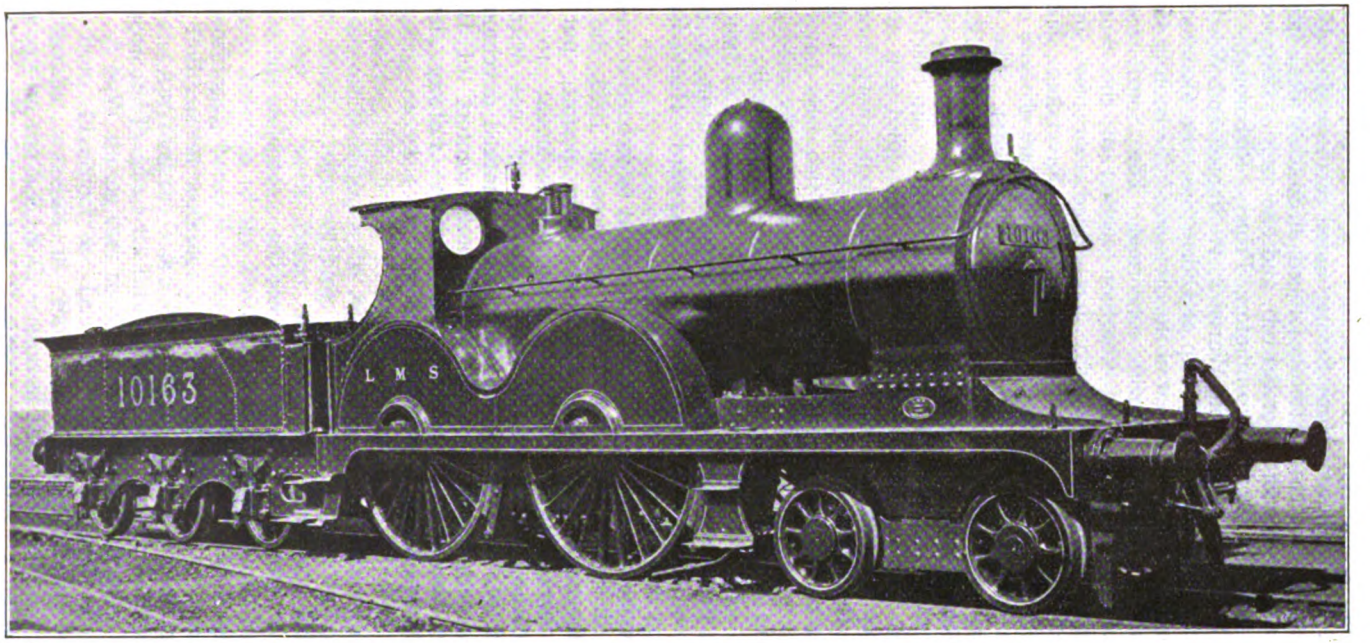
L.M. & S.R. LOCOMOTIVE PAINTED AND NUMBERED IN THE NEW STYLE.



IT has been decided that passenger locomotives belonging to the London Midland and Scottish Railway shall be painted in the style formerly standardised on the Midland Railway, namely, a dark red, with black panelling and yellow lines, and several engines have already been treated in this manner, including one of the "Claughtons" on the London and North Western Section, a four-cylinder 4-6-0 type Horwich-built locomotive, and one of the Aspinall 4-4-0 type express engines, which latter, by the courtesy of Mr. George Hughes, C.B.E., Chief Mechanical and Electrical Engineer, we are enabled to illustrate herewith. The letters "L M S" appear on the trailing wheel splashers, and the number of the engine in bold characters on the sides of the tender. A small plate is attached to the main frames of the engine at the base of the smokebox on each side bearing the initials of the railway company and the year and name of the works in which the engine was originally constructed. The passenger locomotive stock of the London Midland and Scottish Railway will in future be painted in accordance with the new scheme, whilst the goods engines will be painted black. The line of demarcation will be drawn in accordance with the class of work the engines are ordinarily employed upon.

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New Four-Cylinder 4-6-0 Locomotives, Great Western Railway.

WE are indebted to Mr. C. B. Collett, O.B.E., Chief Mechanical Engineer, Great Western Railway, for the photograph reproduced as frontispiece and particulars of a new series of four-cylinder 4-6-0 locomotives recently placed in service. They are known as the "Castle" class, and bear names and numbers as follows :—

No. 4073, *Caerphilly Castle.*
No. 4074, *Caldicot Castle.*
No. 4075, *Cardiff Castle.*
No. 4076, *Carmarthen Castle.*
No. 4077, *Chepstow Castle.*
No. 4078, *Pembroke Castle.*
No. 4079, *Pendennis Castle.*
No. 4080, *Powderham Castle.*
No. 4081, *Warwick Castle.*
No. 4082, *Windsor Castle.*

The design includes several important constructional developments compared with that of engines of the same general class already in service. Larger cylinders have been fitted and a new boiler has been designed. While retaining the special features of the G.W.R. standard boilers, the dimensions have been increased, the barrel being 5 ft. $1\frac{5}{16}$ in. at the front end and 5 ft. 9 in. at the throat plate, the length remaining at 14 ft. 10 in., as in the case of the No. 1 Standard. The firebox is of the same design as that fitted to the No. 7 Standard boiler, and has the same grate area.

The inside cylinders are supplied with steam through passages in the saddle supporting the smokebox, the steam pipes for the outside cylinders being brought through the sides of the smokebox and connected direct to the steam chests. The provision of larger cylinders brings the tractive effort up to 31,626 lb. at 85 per cent. of full boiler pressure, compared with 27,800 lb. in the case of the present four-cylinder class, thus giving the new engine higher tractive power (partly due to the high steam pressure) than even the 4-6-2 three-cylinder engines of the L. & N.E.R., Great Northern Section (29,800 lb.), and North Eastern Section (29,918 lb.).

Advantage has been taken of the increased length of the frame to provide a longer cab than hitherto usual. This, coupled with the fact that no fittings project into the cab beyond the regulator handle, gives greatly increased space for the driver and fireman. The roof has also been considerably extended and the cab sides fitted with large windows, a further innovation being the provision of tip-up seats for the driver and fireman.

It will be noted that the engine is fitted with a copper top to the chimney, and brass safety-valve cover. The cab and splasher beadings are also in brass and the hand rails are now polished. This is the first engine to be turned out since the war with lining, &c., as in pre-war days. All engines of the 2900 and 4000 class will in future be lined and finished in this manner as they pass through the shops.

Leading dimensions are as follows :—

Cylinders (4)	16 in. × 26 in.
Coupled wheels, diam.	6 ft. 8½ in.
Bogie wheels, diam.	3 ft. 2 in.
Steam pressure, per sq. in.	225 lb.
Heating surface—	
Tubes	1885·62 sq. ft.
Superheater	262·62 sq. ft.
Firebox	163·76 sq. ft.
Total	2312 sq. ft.
Grate area	30·28 sq. ft.
Adhesion weight	58 tons 17 cwt.
Engine weight, working order	79 tons 17 cwt.
Tender, water capacity	3,500 gall.
Tender, coal capacity	6 tons
Weight of tender in working order	40 tons
Weight of engine and tender in working order	119 tons 17 cwt.

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Renamed Stations on British Railways.

AS indicated last month, now that in many instances stations previously belonging to different railways are now on the same system, a number of stations are being renamed or their names modified. Particulars of such changes have been issued officially as follows :—

London and North Eastern Railway.

Previous Name & County.	Altered Name.
Abbey (Norfolk)	Abbey and West Dereham.
Alexandra Park (Lancs.) ..	Wilbraham Road.
Alexandra Park (Lanark) ..	Alexandra Parade.
Alford (Lincoln)	Alford Town.
Appleby (Lincoln)	Appleby (Lincs.).
Bolton (Suffolk) ..	Belton & Burgh.
Brandon (Norfolk)	Brandon (Norfolk)
Burgh (Cumberland) ..	Burgh-by-Sands.
Burgh (Lincoln)	Burgh-le-Marsh.
Cambridge (G.N. Goods) (Cambridge)	Cambridge (Upper Yard).
Carlton (Durham)	Redmarshall.
Cockfield (Durham) ..	Cockfield Fell.
Crossgates (Fife)	Crossgates (Fife).
Crowle (G.C. Station) (Lincs.)	Crowle Central.
Doncaster (G.N. Station) (Yorkshire)	Doncaster Central.
Doncaster (H. & B. & G.C. Station) (Yorkshire)	Doncaster York Road.
Enfield (Middlesex) ..	Enfield Chase.
Gainsboro' (G.N. & G.E. Station) (Lincoln)	Gainsboro' North.
Gainsboro' (G.C. Station) (Lincoln)	Gainsboro' Central.
Haddenham (Cambridge) ..	Haddenham (Cambs.).
Haughley (G.E. Stn.) (Sufflk.)	Haughley West.
Haverhill (G.E. Stn.) (Sufflk.)	Haverhill North.
Hertford (G.N. Stn.) (Herts.)	Hertford North.
Hertford (G.E. Stn.) (Herts.)	Hertford East.
Holme (Yorkshire) ..	Holme Moor.
Holton (Lincoln)	Holton-le-Moor.
Hucknall (G.N. Stn.) (Notts.)	Hucknall Town.
Hucknall (G.C. Stn.) (Notts.)	Hucknall Central.
Huntingdon (G.N. Station) (Huntingdon)	Huntingdon North.
Huntingdon (G.N. & G.E. Station) (Huntingdon)	Huntingdon East.
Junction Road (Edinburgh)	Junction Bridge.
Kenton (Northumberland)	Kenton Bank.
Kimberley (Norfolk) ..	Kimberley Park.
Kirkby - in - Ashfield (G.C. Station) (Nottingham)	Kirkby-in-Ashfield (Central).
Langford (Essex)	Langford & Ulting
Middleton (Northumberland)	Middleton North.
Moss (Denbigh)	Moss & Pentre.
Narboro' (Norfolk) ..	Narboro' & Pentney.
Newport (H. & B. Station) (Yorkshire)	Wallingfen.
Newport (Essex)	Newport (Essex).
Park (Middlesex)	Northumberland Park.
Parkhead (Durham) ..	Blanchland.
Peterboro' (G.N. Station) (Northants)	Peterboro' North.
Peterboro' (G.E. Station) (Huntingdon)	Peterboro' East.
Ramsey (Huntingdon) ..	Ramsey North.
Ramsey High St. (Hunts.) ..	Ramsey East.
Reepham (Lincoln)	Reepham (Lincs.).
Retford (G.C. Stn.) (Notts.)	Retford Thrumpton.
Stepney (Middlesex) ..	Stepney (East).
Stow (Norfolk)	Stow Bardolph.
Sutton - in - Ashfield (for Huthwaite) (Notts.)	Sutton-in-Ashfield (Town)
Sutton-in-Ashfield (Notts.)	Sutton-in-Ashfield (Central)
Thorne (N.E. Stn.) (Yorks.)	Thorne North.
Thorne (G.C. Stn.) (Yorks.)	Thorne South.
Thornton (Fife)	Thornton Junc.
Tuxford (G.N. Stn.) (Notts.)	Tuxford North.
Tuxford (G.C. Stn.) (Notts.)	Tuxford Central.
Watton (Norfolk)	Watton (Norfolk).
Wells (Norfolk)	Wells-on-Sea.

Southern Railway.

(Further changes of name.)

Old Name and Section.	New Name.
Ashford (S.E. & C.) ..	Ashford (Kent).
Ashford (L. & S.W.) ..	Ashford (Middx.)
Bexhill (S.E & C.)	No change.
Gillingham (S.E. & C.) ..	Gillingham (Kent)
Gillingham (L. & S.W.) ..	Gillingham (D'rst)
Tunbridge Wells Central (S.E. & C.)	Tunbridge Wells West.
Blackwater and Camberley (S.E. & C.)	Blackwater (Hants).
Blackwater (I. of W.C.) ..	Blackwater (I. of W.)
Chipstead and Banstead Downs (S.E. & C.)	Chipstead.
Banstead and Burgh Heath (L.B. & S.C.)	Banstead & Burgh Heath.
Ford (L. & S.W.)	Ford (Devon).
Ford Junc. (L.B. & S.C.) ..	Ford (Sussex).
London Rd. (L. & S.W.) ..	London Road, Guildford.
London Rd. (L.B. & S.C.) ..	London Road, Brighton.
Shoreham (S.E. & C.) ..	Shoreham (Kent).
Shoreham-by-Sea (L.B.&S.C.)	Shoreham-by-Sea.
Coulsdon West to be Coulsdon North.	

London Midland and Scottish Railway.

Kilburn and Maida Vale (L. & N.W.)	Kilburn High Road.

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RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition (1923) of this standard railway reference work is on sale at 5s. net, or by post from the RAILWAY MAGAZINE Offices, 33, Tothill Street, Westminster, London, S.W.1, 5s. 6d., Overseas, 5s. 8d.

Signalling at Lewisham.

We are indebted to Sir Percy Tempest, General Manager, S.E. & C. Section, Southern Railway, for the following information in regard to the signalling at Lewisham: The signal specially indicated, located on the down line from Lewisham Junction towards Ladywell shortly before passing under the main routes, is Ladywell Down Outer Home Signal. This is slotted by Lewisham Junction as a Down Advance Signal for the Mid Kent Line, to protect the crossover road situated in advance of Lewisham Junction Down Mid Kent Starting Signal. Under various circumstances the following signalling operations can be performed: (1) Lewisham Junction Down Mid Kent Starting Signal can be pulled off when the line is clear to the advance signal; (2) Lewisham Junction can pull over the "slotted" signal lever when the lock on the lever is released by the operation of the block instrument by the signalman in Ladywell cabin; (3) trains are held at the advanced starting signal if "Line Clear" has not been received from Ladywell; (4) a second train can be accepted with a preceding train standing at the Down Advance Signal.

[Reply to H. A. POPER.]

Belfast and County Down Railway.

With regard to the points raised by you, we are informed officially as follows:—

"The 4-6-4 tank engines in question are exclusively used on the Bangor branch, working between Belfast and Bangor. At this period of the year the average load would be 14 six-wheeled coaches, with from four to seven compartments per vehicle. On the main line the trains are worked by 4-4-2 tank engines, but the loads vary according to the importance of the trains. The Bangor branch tank engines were specially designed for the heavy trains run to and from Bangor, the traffic having grown so much as to necessitate longer trains and heavier coaches than anything formerly worked on this branch. We have on some occasions run 16 coaches on trains to Bangor, but for the want of platform accommodation at some of the stations do not care to exceed 14, except on through trains. The engines have proved a success, and perform their work satisfactorily."

[Reply to W. R.]

Grouping Changes.

Particulars have already been given of the liveries adopted for locomotives and

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rolling-stock of the London and North Eastern Railway. As stated elsewhere, Midland red is to be the standard for the London Midland and Scottish Railway, but no information is available as yet in regard to the Southern Railway. These and other details, such as the colours to be adopted for steamers, are matters which will receive attention in due course. Great Western express locomotives are now being finished as in pre-war days. No doubt, when new locomotives are built, they will be more or less standard for all sections of the grouped railways concerned. It will, however, be many years before the principal present-day classes are superseded, and probably some of the designs will still be used for new construction.

[Reply to A.S.T., W.E.H., E. RAVENSCROFT and others.]

Redhill Junction.

The section of line between Coulsdon and Redhill, although owned by the late South Eastern Railway, was used also by London Brighton and South Coast Railway trains by virtue of reciprocative running powers. Construction by the "Brighton" Company of the "Quarry" avoiding line from Coulsdon to Earlswood gave them, however, a main line which avoided Redhill and which did not require them to use the crowded lines of the older route. Hence, for many years past all principal "Brighton" expresses have taken the "Quarry" route, except in the case of trains requiring to call at Redhill. Therefore, it is very exceptional for any "Brighton" trains to pass through Redhill without stopping, and the total number of through trains taking that route is relatively small as compared with those travelling via the new line.

[Reply to A. R. PINK.]

Brighton, Bournemouth, Ilfracombe and Cardiff Through Train.

This train, leaving Brighton at 12 noon, after leaving Chichester, runs *via* Havant and Cosham (not calling) to Fareham, where it connects with the 12.55 p.m. from Portsmouth and Southsea, a through train for Southampton and Bournemouth. The Ilfracombe and Cardiff portions leave Fareham at 1.31 p.m. for Eastleigh, continuing thence to Salisbury direct, while the Bournemouth portion leaves at 1.38 p.m. and travels *via* Netley. At Salisbury the Ilfracombe portion is attached to the 1.0 p.m. from Waterloo, while the Cardiff vehicles leave at 2.40 p.m. *via* Westbury and Trowbridge to Bath.

[Reply to "WOODRIDGE."]

L. & N.E. Locomotives and Rolling-Stock.

The new liveries are now to be observed frequently on all sections. Although a few tank and small-wheeled tender locomotives were at first painted green on various sections, we understand that the practice now is for all locomotives having coupled wheels below 6 ft. diameter to be painted black, so that only the actual express locomotives will be green. Passenger rolling-stock is painted in the old Great Northern fashion, and lettered L.N.E.R., with initial letters suggesting the section to which they are attached. Horse boxes are painted chocolate brown.

[Reply to A. R. HARRISON and G. F. RAYNOR.]

Eastern and Midlands Railway Locomotives.

As far as we can ascertain, prior to the formation of the Midland and Great Northern Joint Railway the locomotives of this line were painted yellow, very much in the same style as that now adopted. Presumably, in referring to saddle tank locomotives with tenders, noted at Lynn in 1898, you have in mind the side tank ex-Cornwall Mineral Railway tank engines which were fitted with tenders to provide additional water capacity, as mentioned by Mr. Ahrons on page 129 of the August RAILWAY MAGAZINE.

[Reply to J. M. ADAMS.]

North London Railway.

We have no reason to understand that the well-known 4-4-0 tank engines have proved in any degree inefficient when working services over the Great Northern section of the London and North Eastern Railway, though no doubt there have been locomotive failures, as must occur on any line now and then. Locomotives belonging to other sections of the London Midland and Scottish Railway, including Lancashire and Yorkshire, Midland, and London and North Western tank engines, have however been used to some extent for trial purposes on the North London services.

[Reply to "COLOUR LIGHT."]

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" Priming."

At times, especially if the boiler has a full supply of water, and at starting, water is carried over with the steam in amounts sufficient to be noticeable by anyone near the engine. This condition is known as " priming." It should, of course, be a temporary condition only; if continued, the water in the boiler is too high and the steam space correspondingly restricted, or the engine is not working well. In the case you mention had the word " steel " been used instead of " metal," the application would have been clear.

[Reply to " 4-6-4 T."]

Water-troughs.

The distance an engine can go without renewing its water supply depends on tender water capacity, gradients of the route, and the load and speed of train. On most lines having a number of water-troughs, these are rarely much more than 40-60 miles apart, and for the shorter distances it is practicable to use tenders having a relatively small water capacity. When distances are longer, tenders must be of fairly large size in order to carry enough water to reach the next set of water-troughs.

[Reply to T. A. PALMER.]

2-6-0 Locomotives, Great Western Railway.

These engines work the " Cornish Riviera " express west of Plymouth. They may also render assistance between Newton Abbot and Plymouth, when that is necessary, because of a very heavy load. But they would not, of course, be used for the through journey, though it is possible, in the event of a locomotive failure, one might be put on for part of the journey if it were the best engine immediately available.

[Reply to " REDGAUNTLET."]

Lines in the Ayr District.

Dalmellington branch leaves the main line from Ayr to Girvan at Dalrymple Junction. Rankinston branch effects junctions with the Dalmellington branch at Holehouse Junction, and with the Ayr and Muirkirk line at Belston Junction. Only one passenger train is run daily from Rankinston to Ayr *via* Belston Junction and Annbank, all the remaining services, and all services in the opposite direction, being provided *via* Holehouse.

[Reply to A. P. MIALL.]

Locomotive Numbering, London Midland and Scottish Railway.

We understand that Nos. 1 to 4999 are to be allocated for Midland, North Staffordshire and " S.M.J." locomotives; Nos. 5000 to 9999 for London and North Western and Wirral locomotives; Nos. 10000 to 12999 for Lancashire and Yorkshire, Furness, Maryport and Carlisle, Furness and Cleator and Workington Junction locomotives; and Scottish locomotives from 13000 onwards.

[Reply to M. D. EDGIN.]

Penrith and Carlisle Schedules.

The cutting from the *Daily Mirror* sent by you had already been brought before our notice. Obviously, a London Midland and Scottish express is referred to, though " flying express " might equally be interpreted otherwise. Reference is, of course, made to passing times, and there is nothing phenomenal in the fact that a down train should cover most of the Penrith-Carlisle section at 70 m.p.h. when passing Penrith at speed.

[Reply to J.G.I.]

Royal Trains.

The West Coast route is generally used for royal train journeys between London and Ballater, mainly owing to the fact that the practice was initiated in Queen Victoria's time, and the London and North Western Railway provided special rolling-stock therefor. On occasions their Majesties the King and Queen have used the East Coast and Midland routes for royal journeys, where also suitable rolling-stock has been constructed.

[Reply to J. C. CRADDOCK.]

Manchester-Windermere Services.

The 5.5 p.m. from Manchester (Exchange) for Windermere regularly uses what is known as the " Whelley " line, avoiding Wigan, and is timed to pass Bickershaw Junction at 5.28 p.m. and Standish Junction at 5.42 p.m. The route is for a few chains over Great Central metals through Hindley and Platt Bridge, but this is a standard traffic arrangement and not one arising as a result of grouping.

[Reply to REV. C. T. HARTLEY.]

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Great Western Railway Rolling-Stock.

As you will see by the article elsewhere in this issue describing the new "Castle" class locomotives, it is intended that express passenger engines of the "29" and "40" classes shall be finished substantially as in pre-war days. We note your remark that a North British set of coaches is working in the High Wycombe district on London and North Eastern (Great Central) services.

[Reply to H. HULL and Others.]

Great Northern Locomotives.

All the 0-4-2 tender engines have been withdrawn from stock, though it is possible that a few remain on the duplicate list. Full information as to the Stirling and older Ivatt locomotives is given in "The Locomotives of the Great Northern Railway," issued by the Locomotive Publishing Co., Ltd., 3, Amen Corner, E.C.4.

[Reply to A. C.]

Midland Train Control.

Particulars of the code symbols used on the Midland Division of the London Midland and Scottish Railway for identification of rolling-stock were set forth on page 230 of the RAILWAY MAGAZINE for October, 1921. For more extended particulars see "The Train Control of the Midland Railway," copies of which can be supplied from this office, price 5*s*.

[Reply to K. A. WERRETT.]

Great Western Locomotives in Manchester.

We have no information as to whether Great Western 2-6-0 locomotives are not now allowed to proceed beyond Patricroft. This may be the case, but more probably these engines are better employed on other sections during the summer months, their places being taken by 4-4-0, 2-4-0 and 0-6-0 locomotives on these services.

[Reply to S. RICHARDS.]

Red Bands on Mileposts.

The red bands you have noticed painted on certain of the mileposts located along the London and South Western section of the Southern Railway indicate division points for the permanent way gangs responsible for the maintenancee of the track.

[Reply to J. C. PALMER.]

Southern Railway Locomotives.

London and South Western 0-4-4 tank engine No. 126 has been rebuilt with a larger boiler, with the object of increasing its power capacity in view of the heavy loads often worked by these engines, and the fact that there will always be many duties suitable for them, even should electric traction be greatly extended.

[Reply to F. G. TYACK.]

Swinton and Knottingley Railway.

The letters S and K are, presumably, the initials of this line. It was constructed jointly by the Midland and North Eastern Companies, and opened for passenger traffic on July 1, 1879. It is now worked jointly by the London Midland and Scottish and London and North Eastern Railways.

[Reply to E. M. SANDERS.]

Locomotive Booster.

The booster can, of course, be brought into action at any time, and would be used not only for starting but when ascending long banks. As it is brought into gear by a pneumatic device it can be engaged even when running at considerable speeds. Further remarks in your letter are noted.

[Reply to B. STEWART BROWN.]

"Practical Railway Working."

We would suggest Travis, Lamb and Jenkinson's book under this title. This deals with all phases of railway operation, and necessarily includes reference to the duties of a traffic inspector. Naturally, however, this is a position only to be attained after experience in other grades.

[Reply to W. J. DAVIES.]

Locomotive Interchanges.

Extended references to the work of London and North Western, Great Western, Great Northern and other locomotives on foreign lines were made in our pages at the time these and other interchanges were made. Brief particulars were given in the 1922 edition of the RAILWAY YEAR BOOK.

[Reply to T. H. PALMER.]

Great Northern 4-6-2 Locomotives.

Surely, as a reader of the RAILWAY MAGAZINE, you cannot have been unaware of the fact that there are a number of 4-6-2 locomotives now in service on the Great Northern section of the London and

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North Eastern Railway. They are numbered from 1470 onwards.

[Reply to J. R. INGOLDBY.]

Whitby and Pickering Railway.

For full particulars of this line we would refer you to Mr. G. W. J. Potter's book entitled "The Whitby and Pickering Railway" (now out of print), and to articles in the early issues of the RAILWAY MAGAZINE (also out of print).

[Reply to H. C. WRIGHT.]

Great Western Locomotive No. 2900.

This engine, for many years known as No. 100, was the first 4-6-0 express locomotive on the Great Western Railway, and bears the name of its designer, Mr. William Dean. It was under Mr. Churchward that the class was principally developed.

[Reply to A. C.]

"Tilbury" Section, L.M. & S.R.

Large 4-4-2 tank engines now numbered from 2110 have been built at Derby, but to the same drawings as the corresponding rebuilt class. Small 4-4-2 tank engines which previously bore the numbers 2110-2119 have been renumbered 2200-2209.

[Reply to "TILBURY SECTION."]

4-6-4 Electric Locomotive, London and North Eastern Railway.

This engine was constructed mainly for trial and demonstration purposes. Obviously, it cannot be used for the work in view of which it was designed until a sufficient length of main line is equipped for electric traction.

[Reply to F. G. TYACK.]

Great Northern Railway, Ireland.

We are not aware as to any special history attaching to the fact that the standard colours for rolling-stock and locomotives on this line were, until recently, the same as those adopted by the English Great Northern Railway.

[Reply to H. F. D. W.]

London Brighton and South Coast Railway Locomotives.

The last issue of the RAILWAY MAGAZINE including a colour plate of one of these locomotives, was that of November, 1916, when No. 327 was thus illustrated. This issue is now out of print.

[Reply to W. E. H.]

Tanat Valley Railway.

This line was amalgamated with the Cambrian system on March 12, 1921, and therefore now forms part of the Great Western Railway, having been taken over with the Cambrian Company.

[Reply to R. HOGAN.]

Canterbury and Whitstable Railway.

The tunnel on this line is, we believe, not only the oldest in England but also in the world. It also probably has the smallest dimensions of any used by ordinary railway rolling-stock.

[Reply to "WOODRIDGE."]

Rolling-Stock Weights.

These vary so much between the designs built at various dates that it will be better for you to note the weight particulars which usually appear at the ends of the various vehicles.

[Reply to T. H. PALMER.]

Bodmin and Wadebridge Railway.

This line has several times been described in issues of the RAILWAY MAGAZINE. See articles published in the September, October and November, 1911, numbers, entitled "Communications in Cornwall."

[Reply to R. B. FELLOWS.]

Great Southern and Western Railway Locomotives.

The "400" class of 4-cylinder 4-6-0 locomotives was illustrated, with full dimensions, in the October, 1914, number of the RAILWAY MAGAZINE.

[Reply to S. H. FLEMING.]

4-6-0 Engines ex-Highland Railway.

Engines Nos. 938-943 on the Caledonian section of the L.M. & S.R. were transferred from the Highland Railway before the amalgamation.

[Reply to "CLAN STUART."]

Great Western Railway Rolling-Stock.

The letters "H.W." appearing at the ends of 70 ft. elliptical-roofed carriages indicate that the lavatories are fitted with hot-water supply.

[Reply to W. S. U.]

East Indian Railway.

The *Railway Gazette*, dated August 10, included a series of maps of Indian railways, and these would probably serve your purpose.

[Reply to W. J. DAVIES.]

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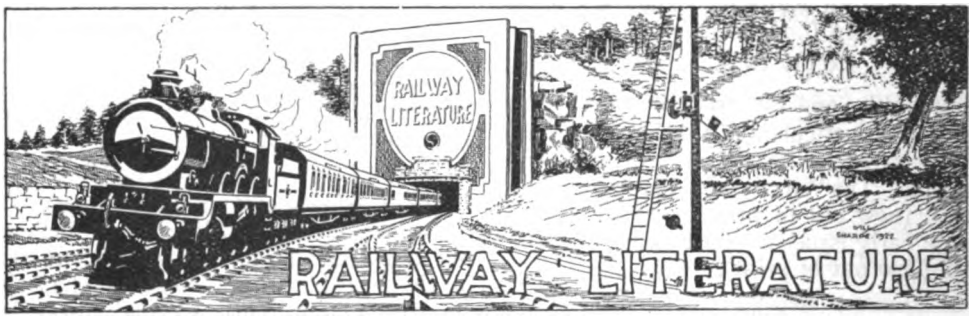

THE RAILWAYS OF INDIA. [London: The Railway Gazette, 33, Tothill Street, Westminster, S.W.1. India: A. H. Wheeler & Co., Bombay, Calcutta, etc. Price 5s. net.]

Ten years ago two special Indian numbers of *The Railway Gazette* were published and during the past decade they have been the standard reference works for the railways of Hindustan. The special number published on September 17, this year, deals more particularly with the history of the railways since 1913, their position to-day, and their prospects and programmes for the future. It is a publication extremely wide in its scope and appeals to all who are interested in any phase of railway life and work, whether management, engineering—both civil and mechanical—or operation.

Outstandingly remarkable are the illustrations numbering no fewer than 160, mostly photographic reproductions of railway locomotive and general rolling-stock, railway stations and yards, workshops, and general engineering features such as viaducts, docks, signalling and the like. Several valuable diagrams are included and six maps. Of the latter one shows the railways of India as they are to-day, and the others furnish outlines of the proposed grouping of the various systems.

The literary portion of the special number is particularly well done and informative. It includes a brief survey of the Indian railway problem, an analysis of the possibilities of grouping, and in regard to the Bengal–Nagpur Railway it describes recent developments which include the construction of several branch lines, a big harbour scheme, the reorganization of the operating departments, and the provision of improved equipment for the maintenance and repair of railway plant.

On the East Indian Railway during the past decade traffic has increased considerably and to meet the requirements tracks have been doubled, stations and yards remodelled, and additional workshop accommodation provided. Regulation of traffic by means of train control began in 1916 and has since been extended all over the main line.

Extensive improvements are recorded in progress on the Lahore–Rawalpindi–Peshawar section of the North Western Railway; while new workshops and additions to the train control are among the other important schemes in hand.

In regard to the Great Indian Peninsula Railway a summary of the traffic developments, track and station improvements and electrification measures in hand are given, likewise particulars of the Thull Ghat re-alignment and the reorganisation of the operating departments.

On the Madras and Southern Mahratta Railway old locomotives and rolling-stock are being replaced by modern types, while other projects include a new marshalling yard, station improvements, new headquarters, and many other important bridge renewals.

Turning to the section devoted to the Oudh and Rohilkhand Railway the special number provides information as to the important bridge renewals and line widenings that are in progress, while train control is being extended, workshop facilities augmented, and the organisation developed to meet the increasing requirements of the traffic.

On the Bombay, Baroda and Central India Railway the Bombay traffic problem is being met by extensive developments, including track widenings, station remodellings and large electrification schemes. Other improvements are projected, notably in the provision of more powerful locomotives and improved carriage stock.

Of the Bengal and North Western Railway—the chief private line in India—valuable traffic and operating details are given, together with a description of Gorakhpur locomotive, carriage and wagon shops, and particulars of the largest bridges. Following this comes a chapter describing some of the difficulties overcome by the Eastern Bengal Railway and then another dealing with the Burma Railways. The

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latter includes main line doubling, construction of a branch into the Southern Shan States and introduction of train control in the Rangoon area.

A notable contribution is one describing the construction of the Khyber Railway, one of the most remarkable lines in the world. The railway is progressing rapidly and it will connect India and Afghanistan.

Catering on the Indian railways is a difficult problem, and has been solved on many lines by placing the business in the hands of contractors. How well the work is done in spite of conflicting circumstances is graphically described.

Other reliable and informative articles deal with Vizagapatam Harbour, railway collieries and coal areas, etc., and much might be said of the many interesting editorial paragraphs included, that not only provide pertinent facts but add considerably to the attractiveness of this really remarkable special number for which we may venture to predict an extraordinary demand not only in India and in Great Britain but throughout the world.

RAILWAY GROUPS COMPLETED: AMALGAMATION AND ABSORPTION SCHEMES, FINAL DIVIDENDS, TABLES, &c. [Published by Frederick C. Mathieson and Sons, 16, Copthall Avenue, E.C. 2. Price 1s.]

This booklet follows several previous publications dealing with financial aspects of railway grouping while in progress, but reviews the process as virtually completed. Following particulars, as generally available, of the constituent and "subsidiary" companies in each group, the financial aspects of the respective stocks of the new companies and the amounts of older stocks for which they were exchanged are set forth systematically. Particulars of the full ordinary dividends of the absorbed railways and broken amounts of preference and debenture stocks are given as for the year 1921 or 1922, according to the date of absorption, while a series of tables is provided indicating the amounts of the respective stocks, prices on December 29, 1922, estimated yield per cent., and highest and lowest figures in 1921 and 1922.

THE RAILWAY YEAR BOOK, 1923.

5s. Net.

"The Railway Year Book," was first published in 1898, and this is the twenty-sixth year of publication. Its title is also given as "The Whitaker of the Railway World," and seeing that it has over 400 pages of tables, statistics, general information about all British and some foreign railways, and details of all the latest developments, together with about two dozen maps, it is living up to its title.

The current issue also contains full particulars of the amalgamations which have taken place; and, taking it altogether, it is a very useful handbook for all interested in railways, particularly the politicians both in and out of Parliament. It has no bias; it does not plead any case, but simply gives facts and figures upon which other people can build their arguments.—*The Sheffield Co-operator.*

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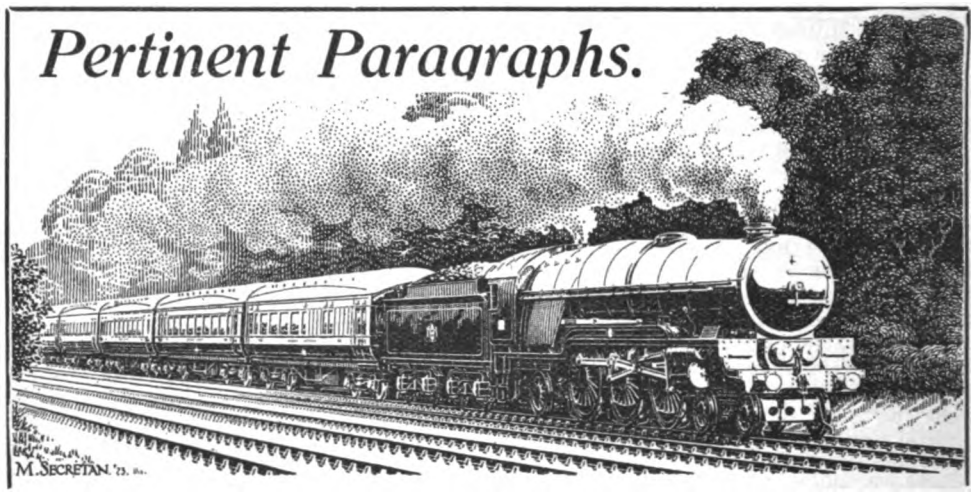

British Railways in 1922.

THE Railway Returns issued by the Ministry of Transport for the year 1922 are of special interest for the reason that they are for the first complete year of de-controlled railway working since the outbreak of war. They are, therefore, in many respects comparable with 1913, the last complete pre-war year. Effective comparisons, however, can only be made in regard to statistics other than financial, the great rise since 1913 in every item making monetary comparisons of little value.

The 1923 returns differ from previous years in that they include Great Britain only. The railways in what is now the Irish Free State no longer come under the purview of the British Ministry of Transport, whilst Northern Ireland is to be dealt with in a separate return. For the purposes of future comparison, the Summary Tables are given for the four railway groups now existing, instead of for individual companies. This enables the results of future years to be compared with the years 1913, 1919–20–21 and 22. Generally, the comparisons in the 1922 tables are made with the year 1921, but the figures for the latter year are not on a normal basis. Railway statistics published monthly by the Ministry of Transport account for the inclusion in the returns of several tables not to be found in those issued in earlier years by the Board of Trade. In addition, a new compilation (C. IV) gives statistics for each railway of the quantities of ballast, fencing, rails and sleepers used, the length of running lines and sidings maintained, and the length of track renewed, all for the year 1922.

Receipts for the whole of the British railways during 1922 totalled £217,349,631, of which the constituent companies in the four groups earned £204,926,017. Capital expenditure increased during 1922 by £3,500,000, making the total £1,174,500,000. The net income for 1922 was £54,517,637, including £1,152,775 from Government compensation reserve. Interest and dividends took £52,000,000, as against £48,400,000 in 1921. Freight tonnage and net ton-miles increased by 38·63 and 26·41 per cent., respectively, over 1921; the figures for 1922 were 319,934,076 tons and 16,798,714,987 ton-miles. Average wagon load increased from 5·07 tons to 5·52 tons and the average train load from 121·17 to 127·54 tons. The average length of haul was less by 5·07 miles; 57·58 in 1921 and 52·51 miles in 1922. Reduced freight rates came into operation at various dates during the year and the average receipt per ton fell from 9s. 10·08d. to 7s. 6·08d. The average receipt per ton-mile in 1922 was 1·714d. Total traffic expenditure for 1922 was 80·24 per cent. of traffic receipts. Private owners' wagons are believed to be decreasing in number, although the number of those broken up are not available, but last year only 3,645 new traders' wagons were registered. The total in August, 1918, was 628,344 and only about 16,000 have been registered since that date. Of the traders' wagons registered last year, only 2 were of 8 tons capacity, whilst 101 were of 20 tons; 260 tank wagons were registered.

Track, Locomotives, Coaching Stock, &c.

Total length of track was 20,298, an increase of only 16 miles during 1922. Of

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the sections of railway dismantled during the war, 25 miles had not been reinstated at the end of 1922. The total length of line, including sidings, was 51,419 miles of standard gauge and 166 miles of other gauges. Passenger traffic fell off to the extent of 2·11 per cent. compared with 1921, but increased by 12·85 per cent. over 1913. The number of journeys, including those of season-ticket holders*, were :—First-class, 103,500,095 ; second-class, 58,347,950 ; third class, 1,587,108,071 ; total, 1,748,956,116. Average fare per passenger journey was :—First class, 5s. 8·37d. ; second class, 3s. 6·12d. ; third class, 1s. 4·52d. ; all classes, 1s. 5·84d. ; workmen, 3·33d. Parcels and other coaching traffic (including £147,220 from passengers' luggage in advance) produced £13,639,329. The total passenger train mileage performed was :—By locomotives, 205,928,423 ; by rail motors, 1,429,993 ; by electric traction, 32,081,716. These figures are exclusive of shunting, light running, &c. The total engine miles, passenger, freight, shunting, light running, piloting, &c., were 540,092,730.

The locomotive stock of British railways was :—Tender, 14,594 ; tank, 9,644 ; rail motors, 113 ; electric locomotives, 81 ; electric motors forming part of passenger cars, 1,452. The passenger vehicles comprised :—Carriages of uniform class, 35,665 ; composite, 11,713 ; restaurant cars, 504 ; and sleeping cars, 152, giving a total seating capacity of 307,915 first class, 86,889 second class, and 2,450,315 third class. There were 20,595 other coaching vehicles. The length of railway solely worked by electric traction was 111½ miles, a decrease of 38 chains compared with 1921, whilst 262½ miles were worked by both electric and steam trains, an increase of 3¾ miles over 1921. The length of line including sidings, &c., reduced to single track, equipped for electric working, was 955¼ miles. Consequent upon the North British Railway not paying certain dividends in 1921 because the Ministry of Transport held back money due to the railway, the Returns for 1922 contain a page of corrections for the 1921 Returns, necessitated by the non-payment of North British Railway preference dividend.

Railway Season Tickets.

It is not surprising that the "threat" of increases in railway season ticket charges has been made much of in the general press, though a great deal of what has been said in the ordinary newspapers has been distinctly irresponsible in character and somewhat wide of the mark as regards appreciation of the real facts. The matter is, of course, closely interwoven with that of standardisation of rates, as provided for by the Railways Act of 1921, though while rates were regarded as covering only those for freight traffic not much attention was paid thereto outside trading and manufacturing circles where, of course, developments in this connection have been and are being carefully watched.

The problem is, naturally, a complex one. Just as a large proportion of the "exceptional rates" of which so much was made a year or so ago have been granted to assist trade and industry, so a considerable percentage of railway season ticket charges are lower (in view of local circumstances, and in order to encourage long-distance residential traffic) than the mileages and facilities covered warrant. In course of years, however, so large a proportion of both passenger and freight traffic rates have come to be of a non-standard character that the ultimate need for a degree of standardisation was foreseen long ago. Hence the inclusion in the Railways Act of 1921 of provisions for the setting up of the Rates Tribunal, a body of responsible experts whose duty it is to consider the whole question and to advise as to the extent to which standardisation is practicable and desirable.

The Railway Rates Tribunal.

This tribunal has, therefore, for some considerable time, been engaged in studying the question of rates in all its phases, and has called upon the railway companies to furnish details of rates for the transport of various commodities and now of season ticket charges, on a standardisation basis. It does not, however, follow that these rates and charges will be imposed as thus set forth. In fact, the object of their publication (as provided for by the Railways Act) is to ensure justice to traders and the general public. It is open to trade associations and others to challenge any or all of them, and to show cause why they should not be imposed. The object is, however, unless a good case can be made out for alternative action, to equalise rates and charges, *reducing any which are above standard* as well as increasing those which are below standard, in order to arrive at equitable amounts which are to constitute the *authorised* standards of the future. It does not follow, however, that such *authorised* standards would be ruthlessly applied. Obviously no objection will be taken to those cases where reductions are proposed. On the other hand there are many instances where present charges are lower than is fully justified. It is important, however, to recognise that where a low rate can be supported by good arguments in favour of its retention it is exceedingly unlikely that it will be increased. Economic reasons

* Computed at 600 per ticket per annum.

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which have caused low rates to be granted still apply in many cases, and it is not probable that serious increases (if any) will be made in such instances. For the present the railway companies have merely complied with the requirements of the Railways Act. The settlement of *authorised* standards rests with the Railway Rates Tribunal of the Ministry of Transport, and even then the *application* of such standards would largely be a matter for the discretion of the respective companies.

As pointed out by the *Daily Telegraph* recently: "The companies, under Clause 41 of the Railways Act, have power to charge a lower rate, and are fully alive to the fact that if fares are too high people will remove elsewhere. The commercial sense of the companies may be trusted to work in the interest of the public as well as in their own."

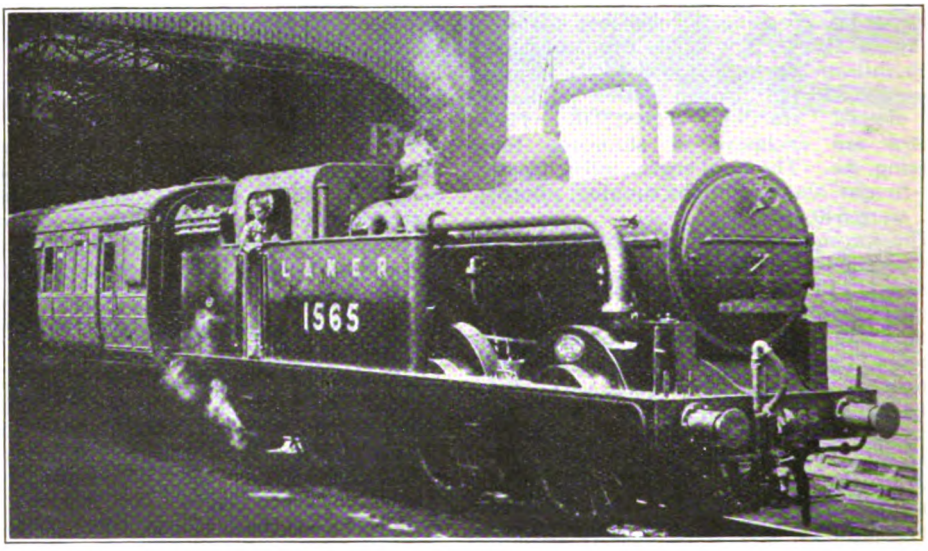

Photo.] LONDON & NORTH EASTERN RAILWAY. [*J. F. Gairns.*

Great Northern 0-6-2 tank engine, painted black and relettered and numbered, on local train at King's Cross station.

"Grouping" Results in Scotland.

An Elgin reader sends some notes concerning traffic working on Scottish railways, particularly the Great North of Scotland and Highland sections, during the past summer, extracts from which include material of interest. "M. D." writes: "Taking the old Great North section first, many passenger luggage vans are appearing painted in the old Great Northern light oak colour, and, of course, lettered L.N.E.R. Likewise, the engines are now appearing in the old black and gold livery of the G.N.S.R., but with the tenders lettered L.N.E.R. over the number. Some of the latest ex-G.N.S.R. engines, superheated, are doing fine work on the mail trains between Elgin and Aberdeen, especially as the trains are at present frequently augmented by through dining and sleeping saloon cars from the South. The composite sleeping saloon ex King's Cross at 7.30 p.m. runs daily, arriving here at 9.56 a.m., going on to Lossiemouth at 10.8 a.m. On the same train (7.45 a.m. ex Aberdeen) comes a breakfast car, which goes through to Inverness, returning from there at 1 p.m. The sleeping car returns to King's Cross from here by the new afternoon mail train, which leaves at 4.30 p.m., and Aberdeen at 7.45 p.m. I have travelled once or twice lately on the 6.45 p.m. ex Aberdeen for here, and have noticed on that train an old eight-wheeled North Eastern third-class coach. This, along with two other carriages, is attached at Cairnie Junction, going forward to Keith, whilst the rest of the train proceeds *via* the coast route to Elgin.

"On the Highland section of the L.M.S. the benefits of the amalgamation have not been so marked. This is partly due, no doubt, to the dislocation of traffic caused by the wash-out on the Aviemore-Inverness direct line. All the north traffic has had to be sent *via* Forres, and as this is single line from Boat of Garten to Forres, the congestion at times has been pretty severe.

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When at Aviemore on one occasion in May I saw the 10.30 a.m. Inverness-Edinburgh and Glasgow train, consisting of 13 coaches—mostly of new Highland corridor stock with through carriages from the North British and Caledonian section—hauled by two of the Clan class, *Clan Fraser* and *Clan Campbell*. I have seen on a local train from here to Forres an old Midland six-wheeler coach painted in the old Midland lake colour and lettered L.M.S. The Highland section of the L.M.S. is badly in need of new locomotive stock for the northern section. Old veterans, such as *Strathdearn* and *Strathnave*, are still running on local trains, and one still older without a name."

High Speed Runs on British Railways.

It is only to be expected that the inauguration by the Great Western Railway of a schedule giving a non-stop average of 61·8 m.p.h. for a distance of 77¼ miles, as set forth in the August RAILWAY MAGAZINE and considered by Mr. Allen in the September number, should have directed public attention to other notable high-speed performances. Thus, *The Times* of August 13 recorded a run on an up two-hour express from Bristol to London, Great Western Railway, when, notwithstanding the exceptionally fast schedule, the journey of 117½ miles was covered in 111 min., the train arriving only 3 min. late, in spite of a start 12 min. late. This run was not, of course, timed with the exactitude usual in the pages of the RAILWAY MAGAZINE, but indicates notable high-speed work, whatever may have been the detail timings noted in seconds over the various stages.

In a subsequent issue of *The Times*, Mr. J. C. Mitchell, of Brackley, pointed out that the 5 p.m. down train from Marylebone is allowed 65 min. only for the 65·1 miles from Aylesbury to Leicester. Mr. Mitchell suggests, also, that the more severe gradients of this route, involving a change of altitude of something like 700 ft., renders this performance at least as notable as that now scheduled at a slightly higher average on the Great Western Railway. He also mentions an instance when the Great Central train stopped at Leicester in 63 min. 20 sec. from Aylesbury. In this connection, brief reference may be made to a recent journey on the Great Central route by the train in question, when it left Marylebone at 4.55 p.m. but had the same time allowance between Aylesbury and Leicester. With a load of about 170 tons, in fine weather, new 4-4-0 engine No. 505, *Ypres*, occupied 30 sec. over the 65 min. allowed. At no stage, however, was exceptionally high speed made, the maximum being little more, if at all, than 75 m.p.h. Reference may also be made to records with this train, including one behind the same engine, recorded by Mr. Allen on page 471 of the June, 1923, number, when a time of 63 min. 20 sec. was recorded and another, behind No. 505, only 5 sec. slower.

The Atlantic City "Flyers."

In view of the special interest attaching to the scheduling of a Great Western express to cover the 77¼ miles from Swindon to Paddington in 75 minutes, thus creating a new start to stop record for British railways, several readers have revived interest in the schedules of the Atlantic City "flyers" between Camden, New Jersey, and Atlantic City. Mr. F. G. Routledge, writing from Montreal, Canada, points out that there are two trains each way daily (except on Sundays) scheduled to cover the 55·5 miles in 55 minutes. Mr. Routledge further writes: "I understand the line is fairly level, with one important junction called Winslow Junction. I am under the impression that some years before the war this run was scheduled in 50 minutes." In reference to this, Mr. Cecil J. Allen remarks: "I am particularly interested to hear of the restoration of Camden-Atlantic City 'flyers' to a 55-minute run. The pre-war allowance was 50 minutes, and time was usually kept or improved upon." There were, in fact, a number of instances when the run was performed in appreciably less than the scheduled 50 minutes to compensate for delays in crossing the Schuylkill River at Philadelphia, for which 10 minutes were allowed, the object being to make the complete journey from Philadelphia to Atlantic City in the even hour. There was, indeed, at least one record run in which the journey was covered in little more than 44 minutes, though we are open to correction, in that this figure is quoted from memory.

Mr. Eric Crickmay, writing from New York, remarks that "many times in the past the subject of the P. & R. expresses between Camden and Atlantic City has been discussed in your columns, but there has generally been an air of mystery or doubt regarding the actual schedules. To settle this matter I have specially secured one of the working timetables (current), and will now tell you the facts of the matter. The exact distance from Camden to Atlantic City station is 55·5 miles, and the fastest booking southbound is 55 minutes, made by four trains. Northbound one train covers the distance in 54 minutes and four trains in 55 minutes. Thus, southbound, the best average speed is 60·5 m.p.h., and, northbound, 61·6 m.p.h.—almost equal to the 3.45 p.m. from Swindon to Paddington." He also gives the passing

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times of the 55-minute coast-bound schedule as follows :—

Miles.	Place.	Time. Min.
0·0	.. Camden	0
0·9	.. Gloucester Junction ..	2
3·1	.. W. Collingswood	4
5·4	.. N.O. Tower	6
8·0	.. S.O. Tower	8
12·0	.. Clementon	12
16·8	.. Williamstown Junction ..	16
24·5	.. Winslow Junction	24
27·5	.. Hammonton..	27
33·7	.. Elwood	33
38·6	.. Egg Harbor	37
43·5	.. Brigantine Junction ..	41
50·5	.. Pleasantville	47
55·5	.. Atlantic City	55

As far as he is aware there are no service slacks.

Mr. Crickmay also sends a folder giving the complete service between Philadelphia and Atlantic City by the Philadelphia and Reading route. This shows the following as being the trains having the 55 or 54-minute schedule between Camden and Atlantic City: From Philadelphia, 8 a.m.; 3 p.m. (*The Boardwalk Flyer*); 3.50 p.m. (not Saturdays); 4 p.m. (*The Rocket*); and on Sundays the 8 a.m. train. Northbound from Atlantic City the corresponding trains are the 6.10 a.m. (*The Baltic*) express, booked in 55 minutes from South Carolina Avenue, Atlantic City, to Camden, a slight increase in distance; the 6.30 a.m. from Atlantic City station (not Saturdays); the 6.40 a.m. (*William Penn*) express; and the 6.55 a.m. express, while the 7.10 a.m. (*Quaker City*) express is booked from Atlantic City station to Camden in 54 minutes. Besides these trains there are several others which are allowed the even hour between Atlantic City station and Camden, or a few minutes only additional, notwithstanding that one or more intermediate stops are included.

In earlier days this run was made by 4-4-2 locomotives, the "Atlantic" type being early introduced therefor, although the type did not obtain its name from this service, as is sometimes stated. The modern locomotives are large 4-6-2's, having 6 ft. 8 in. coupled wheels, and of a class known as the "Boardwalk Model, 125 Class." The folder sent by Mr. Crickmay described the Philadelphia and Reading route to Atlantic City as "the finest stretch of road-bed in America. The grades are negligible. The curves are all under one per cent., and two stretches—one of 18 miles and another 7—are mathematically straight." Reference is also made to the fact there are trains on this route practically "every hour on the hour" and that parlour cars are run on all trains, and dining and club dining cars according to time of day.

Railway Statistics for February, 1922.

In view of our remarks last month in regard to statistics for January, those for February indicate even more definitely how difficult it is to substantiate the claim, usually so glibly made in irresponsible circles, that reduced charges produce compensating traffic increases. Reductions in railway rates and fares may be fully justified in other ways, and it is probable that when the figures for the summer months are published they will show a tangible degree of compensating increase as compared with last year. As a rule, however, reductions in charges result in actual losses for a considerable period, though in due course they may justify themselves, and there may be other factors which influence matters in other ways. But the February figures indicate, if anything, even more clearly that it takes a great deal of traffic increase to compensate for reductions in charges.

For example, the total number of passengers (excluding season-ticket holders) was 87,461,389, a decrease of 110,413, or 0·13 per cent., compared with February, 1922, while the corresponding receipts showed a decrease of £514,663, or 12·39 per cent. The passenger train-miles run were 833,724 more than in February, 1922, an increase of 4·79 per cent. Similarly, freight train receipts (less cost of collection and delivery) in February, 1923, were £9,183,317, a decrease of £470,152, or 4·87 per cent., compared with February, 1922.

Total tonnage of freight traffic conveyed (excluding free-hauled traffic) was 27,347,366 tons, an increase of 3,999,983 tons, or 17·13 per cent., over February, 1922. General merchandise increased by 9·49 per cent.; coal, coke and patent fuel by 14·99 per cent.; and other minerals by 37·17 per cent. Large increases were recorded in iron and steel, ironstone, limestone, pig iron, timber and bricks. The average length of haul for all freight traffic (except free-hauled) fell from 56½ miles to 52¼ miles. While therefore the increase in tonnage was 17·13 per cent., the increase in the corresponding ton-miles was only 8·29 per cent. Freight train-miles run were 904,498 more than in February, 1922, an increase of 8·84 per cent. The average train load increased from 133 tons to 135 tons, but owing to a decline in the rate of movement the net ton-miles per engine hour fell from 454·88 to 453·86.

Pullman Cars.

We are indebted to Mr. L. Merritt Burt, F.C.S., of Wembley, for a lengthy letter discussing various aspects of present-day railway operation and raising several issues of interest, with regard to which a few comments may be made. The first question relates to

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the economic aspects of the extending vogue of the Pullman car. We quite agree that on a majority of the principal main-line trains the passenger who travels in ordinary corridor rolling-stock, whether first or third-class, is very well treated. In fact, there are not many instances now where, for principal trains, inferior rolling-stock is used, though occasionally, while so many of the older vehicles remain in service, this must necessarily occur, more often, perhaps, on some lines than on others.

It must be remembered, however, that although occasionally Pullman cars on individual journeys may not be well patronised, it often happens that the return working gives a load which fully justifies their employment, or that on certain days the service undoubtedly pays for itself, the journeys on other days being provided to maintain the facilities and to ensure that the public is fully aware that the cars are run. Moreover, it must be borne in mind that ordinary rolling-stock calls for capital investment on the part of the railway company, involving also depreciation and interest charges, whereas Pullman rolling-stock costs the railway company nothing.

It must also be remembered that there is a distinct section of the public which is ready to pay supplementary charges, providing that they are reasonable and do not constitute a large addition to the ordinary fares, for superior and special accommodation. Apart from instances where the addition of Pullman cars enables meals or light refreshments to be obtained on trains not otherwise provided with such facilities, experience has, in fact, shown that this section of the public is sufficiently large to justify the provision of such superior accommodation. In any case, it is clear that the Pullman Car Company would not undertake provision of their vehicles so extensively were it not that they obtain sufficient return to compensate for the heavy cost of such vehicles and the staff and equipment therefor. A great point to be remembered is, moreover, that Pullman cars are frequently run on trains which are not provided with restaurant cars, and which would probably hardly justify the introduction of such vehicles apart from the supplements legitimately charged for travel in the Pullman vehicles.

Comparisons of Locomotive Work.

MR. BURT joins issue in regard to suggestions that the London and North Eastern "Pacific" locomotives can be compared with, or regarded as superior in capability to, the 4-6-0 locomotives, both two and four-cylinder, of the Great Western Railway. From the tractive power point of view there may not be a great deal to choose between any of these classes. In fact, the new "Castle" series of four-cylinder locomotives on the Great Western Railway have, on a calculated basis, a greater tractive power than the London and North Eastern "Pacifics," though this is largely contributed to by the high steam pressure used on the Great Western Railway. The greater boiler capacity associated with the "Pacific" type must, of course, be allowed for, and is especially of importance where severe gradients have to be mounted. Seeing that London and North Eastern 4-6-2 locomotives are at present employed for working standard schedules, though with much greater loads than were practicable with the 4-4-2 engines, there are, obviously, few opportunities for indicating exceptional performances on a combined speed and load basis. Possibly, however, new schedules will be introduced in due course which will satisfy Mr. Burt and other critics on this ground. We have no knowledge that the introduction of these large locomotives on the London and North Eastern route has introduced any permanent-way difficulties. Obviously, the highest standard of permanent-way construction is necessary, but that has long applied in regard to most of the high-speed heavy-load main routes, including those of the London and North Eastern Railway.

Double-Heading.

WHILE it is quite true that a large proportion of the principal express trains on the London and North Western section of the London Midland and Scottish Railway are regularly double-headed, it has to be remembered that no other route carries so many trains of exceptional weight. No doubt, in due course, there will be still further developments in locomotive design on this line, including possibly the introduction of the "Pacific" type, but, until that occurs, it is not surprising, notwithstanding the proved abilities of the "Claughton" and Lancashire and Yorkshire four-cylinder 4-6-0 locomotives, that so many trains loading over 400 tons, operated at reasonably high average speeds over routes which have long gradients of moderate inclination as well as steep sections, require the frequent provision of an assisting engine. It is no argument to suggest that a Great Western "City" would regularly perform better work than a London and North Western "Claughton." One of the former engines would, no doubt, deal with a load within its capacity at high speed most efficiently, but in instituting such comparisons it is most important to take into account the gradients and other characteristics of the routes concerned. Similar remarks apply also in regard to 4-4-2 express tank engines. On the sections where the best speed work is done by such engines the Great Western class have a relatively easy road, so it is not surprising that they can,

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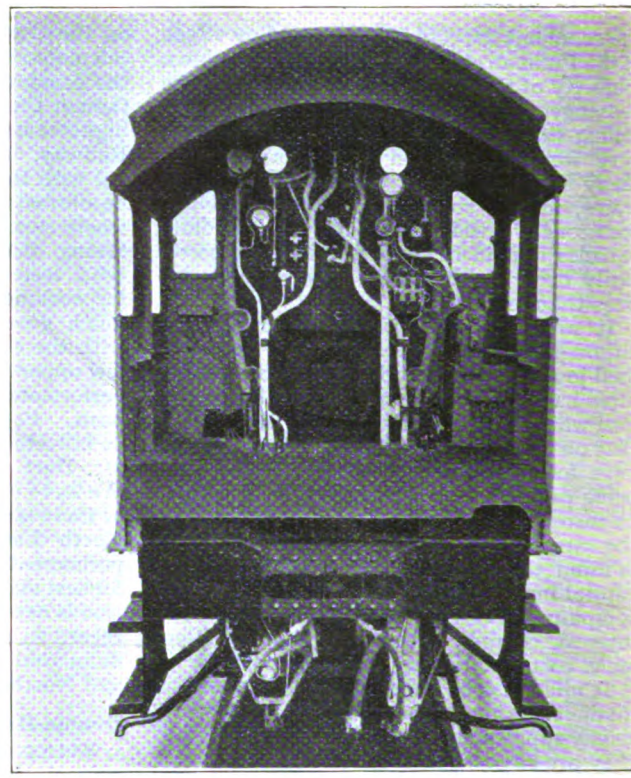
and do, take considerable loads at high speeds, whereas both the London, Brighton and South Coast and North Western lines include, if not notably steep gradients, long sections of many miles in length at gradients which are by no means insignificant and which are often the most "trying." On the "Brighton" line, too, there is the question of traffic delays and the need for careful running for more than 10 miles at the London end. The London and North Western 4-4-2 tank engines are, it may be pointed out, not directly designed for express running, as they have coupled wheels of moderate diameter only. Mr. Burt also mentions a record with the Great Western Swindon–London run, when *Saint Bartholomew*, starting 2½ min. late, with a 13-coach train, reached Paddington dead on time, having covered 77¼ miles in 72½ min. start to stop.



INTERIOR OF CAB OF NEW G.W.R. EXPRESS LOCOMOTIVE.
(*For further particulars see Frontispiece and on page* 311.)

Great Western Speed to Chester.

Much interest has been occasioned by the acceleration of the G.W.R. service between London and Chester, and, consequent upon the big cut made in the time, hopes of a "race" were in some quarters indulged in. The L.M. and S. Railway, however, made no move, and is apparently satisfied with its lead of 23 minutes, over a route 16¾ miles shorter. The L.M. and S. Railway best run is by the 9.30 a.m. from Chester to Euston, 7 minutes quicker than the best down train (10.30 a.m. ex-Euston). The up train stops only at Crewe and Rugby, and has an inclusive speed of 51·2 miles per hour. The G.W.R. best run is performed by the 10.20 a.m. from Paddington, which calls at Birmingham only and is due at Chester at 2.13 p.m., an inclusive speed of 50·2 miles per hour. The feature of the G.W.R. acceleration is the elimination of all stops between Birmingham and Chester. It is a notable advance for G.W.R. trains to pass Wolverhampton and Shrewsbury, whilst most of the expresses call at two or three other stations between Wolverhampton and Chester. The best G.W. up train, which also runs non-stop from Chester to Birmingham, takes four hours, but stops 10 minutes at Birmingham and spends two minutes longer in the 84½ mile run from Chester. The L.M. & S.R. has a good deal in hand in the matter of time and (disregarding the London - Birmingham 2-hour agreement), so also has the G.W.R.

In previous years the G.W.R. point to point times, Birmingham-Wolverhampton, Wolverhampton-Shrewsbury and Shrewsbury-Chester, varied considerably by different expresses, and by picking out the best times between these stations and applying them to one train, the Paddington-Chester journey could have been made more quickly than by the best train, Paddington-Chester, which last year took 2 hours 5 minutes to Birmingham (best 2 hours).

A Great Western Chester-London Record.

In July, 1911, in connection with the Investiture of the Prince of Wales at Carnarvon, the G.W.R. ran a non-stop special train from Chester to Paddington in 3 hours 28 minutes. The special, weighing 60 tons, consisted of two break vans and one saloon, and was hauled by 7 ft. 8 in. single (4-2-2 type) No. 3018. The journey speed was

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56¾ miles an hour, the log being as follows :—

M.	Ch.			p.m.
—	—	Chester	dep.	7·47
42	27	Shrewsbury.. ..	pass	8·36
72	15	Wolverhampton ..	,,	9·5
84	61	Birmingham ..	,,	9·22
107	72	Leamington.. ..	,,	9·44
127	61	Banbury	,,	10·4
160	43	Princes Risborough	,,	10·36
195	18	Paddington.. ..	arr.	11·15

In July, 1911, the G.W.R.'s best booked time to Chester was 4 hours 13 minutes, and the L. and N.W.R.'s 3 hours 32 minutes.

Cheaper Train Fares—But not yet.

REFERRING again to the season ticket controversy, dealt with in a previous paragraph, mention may be made of an article contributed by Sir Herbert Walker to the *Evening News* recently. Sir Herbert pointed out that the economies expected to follow from grouping must take time—probably years—to fructify. In regard to the public expectation of ultimate benefit due to amalgamation, he remarked that "it is safe to predict that, under amalgamation, lower fares and charges will operate than would have been possible under the old conditions." The problem is, however, to a large extent governed by the conditions under which the new Railway Rates Tribunal has to work. Sir Herbert concluded by pointing out that "under present circumstances the rates and charges are based upon an increase of 50 per cent. over the pre-war level. Working expenses, however, are considerably more than 75 per cent. above pre-war, one item alone, namely, cost of labour, showing an increase of about 140 per cent. While this state of things continues there is very little prospect of any further reduction in rates and charges."

Following the early agitation, due partly to the exaggerated notions widely expressed as to the effect of the railway companies' proposals for standard season ticket charges, an unofficial explanation and a statement issued by Mr. G. Cole Deacon, Secretary of the Railway Rates and Charges Committee of the Railway Companies Association, did much to clear the air. The public now understands that standard schedules for season tickets, so far from being desired by the railway companies, were resisted by them and have only been put forward now because, in the opinion of the Railway Rates Tribunal, the Railways Act orders them to be submitted. It has been made clear that the railway companies intend to be guided, as in the past, by commercial considerations in the issue of season tickets, that they have no desire to make sweeping increases, and that the proposed schedules provide for many reductions not at first realised. But there is still some apprehension that, should the proposed schedules be sanctioned by the Tribunal, the railway companies might in the future choose to exercise to the full any increased charging powers thereby given. So far there has been no official pronouncement which directly meets this point, possibly in view of the fact that the whole question will have to be fully inquired into by the Rates Tribunal.

London's Travelling Population.

CENSUS statistics recently published indicate vividly the tremendous differences between the day and night populations of the London boroughs, and the very great volume of travel occasioned by the fact that so many people are employed in districts other than those where they reside, the greater majority travelling by rail or road. That such statistics would involve notable figures was, of course, generally realised, but the official records now available for the first time emphasise the enormous volume of this daily travel between residential and working districts. Attention is confined to the London area and the five home counties, but the statistics are very fully analysed from various points of view. Thus, it is shown that whereas the night population of the City of London is only 13,709, the day population exceeds that of any other metropolitan borough, reaching a total of 416,150, calling for daily inward and outward movement of no fewer than 406,167 (an adjusted figure) persons. Westminster comes second for day totals, 374,102, as compared with 141,578 at night. There are, however, certain inner districts which, though of an industrial character, show fewer persons by day than by night, though areas which rank as residential necessarily include a larger residential than working population. Statistics in regard to movements between the respective areas show that 403,818 persons reside within a radius of 10 miles of the Administrative County of London and work in other districts, 9,125 between 10 and 15 miles, and no fewer than 98,361 beyond the 15-mile radius but within the five home counties, Essex, Hertford, Kent, Middlesex and Surrey.

A South Suburban War-closed Line Reopened.

THE reopening of the Tooting, Merton and Wimbledon Railway on August 27 was an outcome of discussions that arose during the Parliamentary contest on the City and South London Railway's proposal to extend to a junction with the Sutton and Wimbledon Railway.

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The Tooting, Merton and Wimbledon Railway was sanctioned in 1864. An arrangement was made with the late L.B. & S.C.R. to take over the Act, which enabled the L.B. & S.C.R. to abandon a line through part of the district for which it had obtained powers. In 1865 the L. & S.W.R. joined with the L.B. & S.C.R. and the line became joint. The middle and late "sixties" were a period of intense extension of railway facilities in the suburbs of South London. The late L. & S.W. Railway particularly was anxious to get nearer the centre of London than Waterloo. It therefore readily subscribed money to the L.C. & D. Railway's plans for increasing railway facilities in the southern suburbs. Part of the arrangement was that the L.C. & D. Rly. should construct a connecting spur between Herne Hill and the L.B. & S.C.R. at Tulse Hill to enable the L. & S.W.R. to run trains between Kingston and Ludgate Hill. Several new L. & S.W. Railway suburban extensions were opened on January 1, 1869. Amongst others, the line to Kingston, and the joint Tooting, Merton and Wimbledon line, also the L.C. & D. Herne Hill—Tulse Hill spur 74 chains in length (including the 5 chs. at the Tulse Hill Junction). By means of these lines, and running powers over the L.B. & S.C.R. between Streatham South Junction and Tulse Hill, a distance of 2 m. 12 chs., the L. & S.W.R. ran a service of trains from Kingston (New) to Ludgate Hill, over the joint line from its opening. The L.B. & S.C. also utilised the joint line for a service of trains, mainly London Bridge to London Bridge via Wimbledon. A peculiarity of the line is that at Tooting it bifurcates, the two branches forming a loop with Wimbledon at the extreme western end. This loop enables trains for down the late L. & S.W.R. to reach Wimbledon at the north end of the station and trains to the up direction of the L. & S.W.R. to enter Wimbledon from the south end of the station. It also enables trains to run from Tooting to Wimbledon back to Tooting without reversing by two routes, *i.e.*, via Haydon's Road (north section of loop and Merton (south section of loop). The joint railway joined the Wimbledon and Croydon line at Merton Park 50 chains from Wimbledon. To make the joint line complete these 50 chains were made joint also.

The Wimbledon-Croydon Railway.

THE Wimbledon & Croydon Railway was at this time the property of the L.B. & S.C. Railway but it was promoted in 1853 as a joint L. & S.W.R. and L.B. & S.C.R. line and so worked from its opening on October 22, 1855, to the end of that year, when the L. & S.W.R. withdrew its trains. From January 1, 1856, the L.B. & S.C.R. became sole owner of the Wimbledon and Croydon Railway. The mileage of this Tooting, Merton and Wimbledon Joint Railway, comprises the 76 chains of railway from Streatham South Junction to Tooting station, the northern portion of the loop to Wimbledon 2 m. 6 chs. long, the southern part of the loop, Tooting to Merton Park, 1 m. 79 chs., and the 50 chains thence to Wimbledon taken over from the late L.B. & S.C.R. On the north part of the loop is Haydon's Road station, 1 m. 17 chs. from Tooting and on the south part Merton Abbey 1 m. 2 chs. from Tooting, and Merton Park 89 chains from Merton Abbey. Merton Park is also on the Wimbledon and Croydon line.

Kingston and Wimbledon Services.

FOR several years from the opening of the joint line the L. & S.W.R. ran a fair service of trains over the line to and from Ludgate Hill, those to and from Kingston, taking the northern section of the loop and those terminating at Wimbledon the southern part. The L.B. & S.C. provided a service between London Bridge, Wimbledon and London Bridge. In 1893, of the 16 trains from London Bridge to Tooting Junction, 5 reached Wimbledon via Merton Abbey and returned via Haydon's Road, whilst 11 reversed the route between Tooting-Wimbledon-Tooting.

There was a late train from West Croydon over the L.B. & S.C. line to Wimbledon, thence over the joint line via Haydon's Road to Streatham South Junction, and over the West End line thence to Victoria. This train returned to West Croydon by the same route, finishing about 1 a.m. The L. & S.W.R. service from Wimbledon consisted of 8 via Haydon's Road and 6 via Merton Abbey. From Ludgate Hill there were 2 by the former route and 6 via Merton Abbey. Some years after the opening of Holborn Viaduct station these trains terminated and started there instead of Ludgate Hill, the eastern platform being reserved for their use and that of the L. & S.W.R. train via Clapham Junction. When this platform was required for parcels traffic, the L. & S.W.R. trains were diverted to Snow Hill. In January, 1911, this service consisted of 2 trains from Ludgate Hill via Haydon's Road and 9 via Merton Abbey, whilst of the trains from Wimbledon 5 ran via Haydon's Road and 6 via Merton Abbey; 5 short trains in addition ran between Haydon's Road and Wimbledon and vice versa. These were mostly provided by the

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extension of the service via Merton Abbey to and from Wimbledon. The L.B. & S.C. Railway service at this time comprised 17 trains to Wimbledon via Haydon's Road and 9 via Merton Abbey, the trains from Wimbledon being in the reverse order over the loop. Much of this service was provided by a first and third-class motor train running between Streatham and Wimbledon and back. The trains and motor buses were now competing intensely for the traffic of the district. Although the trains were well patronised by town workers—up in the morning, down in the evening—during the remainder of the day the street services carried most of the traffic. The Sunday service by L. & S.W.R. trains was therefore withdrawn, and by July, 1915, there were only three L. & S.W.R. trains up and four down that ran every week-day. On Saturdays there were two additional each way and there were also four up and five down which did not run on Saturdays. The last down on Saturdays left Ludgate Hill at 5.2 p.m. On days other than Saturdays there was no train from Ludgate Hill to Wimbledon between 10.12 a.m. and 5.2 p.m. The L.B. & S.C.R. service was little inferior to that of 1911.

The drastic curtailments of train services that were introduced in 1917 consequent upon war economy resulted in both companies withdrawing their services between Tooting and Wimbledon. The line remained closed until August 27, 1923, with little inconvenience, save during the business rush hours, as the trams and 'buses provide a frequent service through the district.

The New Services.

THE present services of the Southern Railway are provided by the L.B. & S.C. and L.S.W. sections as were those of the pre-closing period.

To Ludgate Hill there are 4 trains every week-day from Wimbledon, 3 Saturdays only and 2 Saturdays excepted. The down train service is similar to the up except that there are 3 Saturdays excepted from Ludgate Hill. The balance working is from Wimbledon to Herne Hill, the last not Saturdays train from Ludgate Hill being worked by S.E. & C. section locomotive and stock, which upon reaching Herne Hill from Wimbledon at 7.24 p.m. takes up a working on the S.E. & C. section. There is one considerable improvement. The trains now provided by the L. & S.W. section are 4-coach bogie sets. In the old days the trains were comprised of close coupled 4-wheel coaches of ancient origin. The trains run to Holborn (Low Level) sidings for shunting.

The L.B. & S.C. section service comprises on other week days than Saturdays 18 from London Bridge (a change at Streatham being required by several) supplemented by 3 locals from Streatham, which do not connect with trains from London Bridge, and one train from Tulse Hill. From Wimbledon to London Bridge there are 20 trains, with change by several at Streatham. There are also 3 locals to Streatham, which have no connections to London Bridge, whilst the last train from Wimbledon (8.12 p.m.) runs only to Tulse Hill. There is no Sunday service over the line.

Ticket Collecting for "Open" Termini.

DURING recent years St. Pancras, constructed as an "open" station, has been made "a closed" station for departing trains, temporary barriers, at which are stationed ticket examiners, being placed at the entrances to the various platforms some time prior to the time a train departs therefrom. This method much restricts the "closed" length of No. 2 platform, as the booking offices, lavatories, &c., open on to it at the buffer stop end, and, therefore, only the portion north of these conveniences can be closed. For up trains, however, St. Pancras remains an "open" station, tickets from up trains being collected at the last stopping station except on corridor trains. For many years, in the case of semi-fasts and suburban trains, this was Kentish Town. Now, however, most of the semi-fast and outer suburban trains do not call at Kentish Town. In several instances St. Albans becomes the collecting station, but to give a better service to Radlett, three of the up semi-fasts call there after leaving St. Albans, and tickets issued at Radlett for London were collected as the passengers joined the train. In *Transport and Travel Monthly* for September, 1922, it was pointed out how this system afforded the dishonest traveller an opportunity to defraud the railway. The L.M. and S.R. has now discontinued collecting tickets at St. Albans in the case of the three trains that call at Radlett, running fast thence to London, Radlett being the collecting station. The circumstance that St. Pancras is "closed" for down and "open" for up trains, at times produces a curious position: one side of a platform is "closed" for a down train and the other side "open" for an up train, both trains being alongside at the same time.

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MR. WILLIAM HENRY BIRD, who has retired from the position of Signal Engineer, Great Eastern Section, London and North Eastern Railway, was apprenticed to Ransomes & Rapier, Ltd., the well-known engineers of Ipswich, and, on completing his apprenticeship, served for two years in the Great Eastern Railway workshops at Stratford. In 1880 Mr. Bird was transferred to the civil engineering side, and was associated with many engineering undertakings of the period dealt with by the department, though in later years he was concerned more particularly with permanent-way and signalling. In 1910 he was appointed Signal Engineer. During his long service Mr. Bird worked under no fewer than six chief engineers.

* * *

MR. J. T. NAISBY, who has been appointed District Goods Manager, Newcastle-on-Tyne, London and North Eastern Railway, commenced as a junior at Morpeth station. After training in the various sections of the Traffic Department at different stations, he was transferred to the Divisional Goods Manager's office, Newcastle. In April, 1898, appointed Chief Clerk to the District Traffic Agent at Carlisle, he, in October the same year, joined the staff of the General Goods Manager at York. On the reorganisation in 1901, he went to the newly-created General Traffic Manager's office, and later was attached to the General Superintendent's office. In 1905 he became Dock Agent at Tyne Dock, and on the retirement of Mr. Joseph Fairless, Mineral Manager at Newcastle, was made Assistant District Goods Manager, with special supervision of the heavy mineral traffic in that area and shipping at the various ports in the district. Mr. Naisby was appointed District Goods Manager at Middlesbrough in 1914, and takes up his new position on October 1, 1923.

Elliott & Fry.

MR. W. H. BIRD,
Late Signal Engineer,
Great Eastern Section,
London and North Eastern Railway.

* * *

MR. H. W. MORGAN, who has been appointed Dock Superintendent at Swansea, Great Western Railway, entered the service of the Swansea Harbour Trustees in their Traffic Department in 1897, and was transferred to the General Manager's office in 1902 as personal clerk to the General Manager. In 1916 he was appointed General Manager's Secretary, and in 1922 Assistant General Manager.

* * *

FOR the future the Great Eastern Railway Musical Society will be known by the larger and more embracing title of The London and North Eastern Railway Musical Society. Mr. William Whitelaw, Chairman of the Board of Directors, is the President, with the Rt. Hon. Lord Faringdon, as deputy-President. Colonel William Johnson Galloway is continuing the office of honorary conductor. Membership is open to any servant of the Company of whatever grade. Rehearsals have been resumed for 1923-4 and another successful season is anticipated.

* * *

SIR JOSEPH G. BROODBANK will deliver his presidential address to the members of the Institute of Transport at the first ordinary

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meeting for the session, 1923-24, which will be held in the Lecture Theatre of the Institution of Electrical Engineers, Victoria Embankment, London, W.C.2, at 5.30 p.m., Monday, October 1. At the same place and at the same time on Tuesday, October 16, Mr. Philip Burtt (Hon. Treasurer), will deliver a lecture on "The Institute Examination Scheme."

* * *

"RAILWAY Rules and Regulations" is the subject of a paper to be read at the Railway Club, 65, Belgrave Road, S.W.1, on Friday evening, October 12, by Mr. B. Wagenrieder, London and North Eastern Railway. At the monthly general meeting on September 14, the lecturer was Mr. B. M. Holyhead, Llandudno, and Windermere. The latest additions to the list are Keswick (to London, Leeds and Manchester), Birkdale, Ainsdale and Freshfield (to Euston), Blackpool (Waterloo Road), St. Annes, Ainsdale and Lytham (to Euston and Glasgow). The payment for reservation is 1s. per seat, first or third class.

* * *

NOTICE of a railway concession to military people has been issued by the War Office as follows:—The railway companies of Great Britain have decided to issue tickets at reduced fares to Army personnel proceeding on leave or furlough. Officers will now obtain first-class return tickets for fare and

MR. J. T. NAISBY,
District Goods Manager, Newcastle-on-Tyne,
London and North Eastern Railway.

MR. H. W. MORGAN,
Dock Superintendent at Swansea,
Great Western Railway.

Bazley, who dealt with "Deficiencies of Railway Grouping" in the inimitable manner that is peculiarly his own.

* * *

SEAT reservation on certain main-line trains of the London Midland and Scottish Railway has proved such a success that from time to time additional stations, between which reserved seats may be booked, are added to the list. During the past month these facilities have been considerably increased. It is now possible to reserve seats at Liverpool (Lime Street, Edgehill, Exchange), Mossley Hill, Blackpool (Central, Talbot Road), Southport (Chapel Street), Fleetwood, Bradford, Halifax, Leeds (New),

a-third, and warrant officers, non-commissioned officers and men, when travelling in uniform, third-class tickets for fare and a-third. Reduced fares will also be available for wives and children of other ranks, members of the nursing services and Army schoolmistresses.

* * *

ALTHOUGH "summer time" in England changed at 2 a.m. on September 16, it remains in force on the Continent until the night of October 6–7. Consequently, the Folkestone–Flushing service previously leaving Victoria at 9.15 a.m. now leaves at 8.45 a.m. to October 6, and will leave at 9.5 a.m. from October 7. In regard to other Continental services the Southern Railway have

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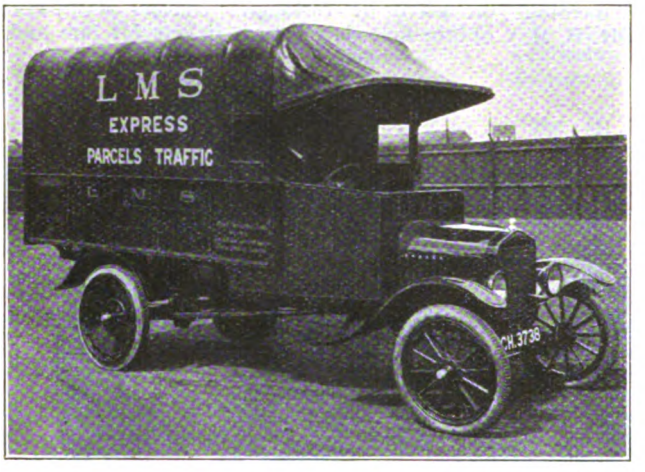
made no alterations in the London departure times, but although during the interim period the arrivals at Continenal ports will be about an hour late by Continental clocks, all international connections will be maintained. The majority of the inwards services from the Continent will arrive in London about an hour earlier until October 6, inclusive.

* * *

By the courtesy of Mr. J. A. Milligan, Passenger Commercial Superintendent (London Division), London Midland and Scottish Railway, we illustrate on this page a new L.M.S. express parcels traffic van.



EXPRESS PARCELS VAN, LONDON MIDLAND AND SCOTTISH RAILWAY.

Statistics for March have been published and can be obtained at His Majesty's Stationery Office (price 3s.). The total number of passenger journeys (excluding season-ticket holders) was 100,478,508, an increase of 3,169,536, or 3·26 per cent., compared with March, 1922. The corresponding receipts, which included the revenue from long-distance passengers booked during the week preceding Easter Sunday, showed an increase of £115,476, or 2·41 per cent. The passenger train-miles run were 596,107 more than in March, 1922, an increase of 3·05 per cent.

* * *

Total tonnage of freight traffic conveyed (excluding free-hauled traffic) was 31,283,407 tons, an increase of 4,506,056 tons, or 16·83 per cent. The tonnage of general merchandise was higher than in any month since November, 1920, and that of other minerals was higher than in any month since September, 1920, while the tonnages of coal, coke and patent fuel, and of total freight, exceeded those for any month since these statistics became available (*i.e.*, in January, 1920). The average length of haul for all freight traffic (except free-hauled) fell from 55·14 miles to 51·54 miles. While therefore the increase in tonnage was 16·83 per cent., the increase in the corresponding ton-miles was only 9·21 per cent. Freight-train receipts (less cost of collection and delivery) in March, 1923, were £10,344,824, a decrease of £797,880, or 7·16 per cent., and the receipts per ton-mile for all descriptions of freight traffic were 1·540d., compared with 1·811d. in March, 1922. The freight-train miles run were 634,046 more than in March, 1922, an increase of 5·43 per cent. The average trainload increased from 130·62 tons to 137·41 tons, and the net ton-miles worked per engine hour from 457 to 466.

* * *

Mr. G. M. Hayward writes in regard to traffic developments in the Midland Counties: "A North Staffordshire 'K' class, 4-4-2 T, No. 14, regularly works into Birmingham, New Street station, returning on the 4.55 p.m. from No. 3 platform. This engine was built in 1912 at the company's works at Stoke-on-Trent. Midland '483' class 4-4-0's, Nos. 507 and 544, shedded at Saltley and Leicester, respectively, have recently been running with the letters 'LMS' in gilt on the cab splashers. Stratford-upon-Avon and Midland Junction Railway 0-6-0 No. 2, has been under repair at Saltley. The engine was constructed some thirty or forty years ago by Beyer, Peacock, and is classed 'A' for traffic purposes. It will be remembered that the S.M.J. has a locomotive stock of twelve 0-6-0 and one 2-4-0 locomotives, all built by Beyer, Peacock, except No. 7, a 0-6-0 purchased in 1920 from the L.B. & S.C.R., where it was numbered 420. There is a 5¾ mile branch, the Edge Hill Light Railway, which possesses two 'Brighton' 'Terriers,' and one four-wheeled contractor's locomotive. The old Midland branch from Whitacre Junction to Hampton is now open, and there is one goods train per day. Apparently, a M.R. 0-6-0 brings the train to Hampton, where a L.N.W.R. 0-8-0 takes charge."

* * *

A firm well-known to owners of model locomotives and trains is Messrs. Vernon Smith & Sons, Ltd., High Road, Chiswick. The firm have taken two more shops, namely, Nos. 87 and 89 in the same road, to cope with

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the increasing business in model repairing. At their other shops, 105, 117, 121 and 123, High Road, Chiswick, they continue the usual business of buying and selling second-hand and other model locomotives and trains. The firm's activities include almost everything in the mechanical, engineering, electrical and allied lines.

* * *

MR. R. S. JOHN, of Surbiton, points out that several of the Waterloo-Portsmouth expresses on the London & South Western Section of the Southern Railway, including the 3.50 and 4.50 p.m. down trains, are now running, as before the war, *via* Claygate. The schedules to Guildford are the same as *via* Woking. He mentions also that 4-6-0 locomotives of the "736" and "486" classes often work these trains. Mr. John remarks further that electric trains are appearing with the words "Southern Railway" over the windows; also that most of the "300" class of "Drummond" 4-4-0 locomotives are now superheated, together with some of the "702" class, one of the latter being No. 729.

* * *

WE illustrate on this page a view of a train of new 12-ton cattle wagons recently turned out of Derby Works for service on the London Midland and Scottish Railway. The height inside of the wagons at sides is 6 ft. 4½ in. and at centre 6 ft. 10½ in., while the inside width is 7 ft. 7 in. By the use of movable partitions three different lengths inside may be obtained, these being, short, 13 ft. 6 in. long inside; medium, 15 ft. 6 in. long inside; long, 18 ft. long inside. The adjustable partition and the arrangement of the wagons generally have been designed to facilitate the loading of cattle with a minimum risk of damage. In these new vehicles the use of asphalt flooring has been adopted in order to protect the timbers of the underframes, which become rapidly decayed by the animal excreta, and to provide a more sanitary bottoming for the wagons. A further innovation is that granite chippings have been introduced into the asphalt to make a non-slipping surface for the cattle. Some of the vehicles are fitted with automatic vacuum-brake through pipes, the tare of such wagons being 8 tons 3 cwt., while the tare of wagons without pipes and fasteners is 8 tons 2 cwt.

* * *

FROM Crewe, Mr. C. Williams writes:—One of the four-cylinder "Claughton" class engines, viz., No. 2511 *Croxteth* is now running painted in Midland colours, and with the new L.M.S. number, 5971, in large gold figures on the tender sides. Other features include a small number-plate on the smokebox door, as in Midland practice, while the initials "L. M. S." have taken the place of the old number-plates on the lower cab panels. It is understood that all passenger engines are to be painted in this livery, as well as the new 0-8-4 tanks, some

TRAIN OF NEW CATTLE WAGONS, LONDON MIDLAND AND SCOTTISH RAILWAY.

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of which occasionally are used on local passenger work. The new numbering commences at 5000, but at present it is impossible to say, except in certain cases, what the scheme really is. Apparently, numbers up to 9999 are being reserved for the London and North Western stock.

There are now 13 of the new 0-8-4 tanks in service, of which the last five, Nos. 1908, 1956, 468, 792 and 793, have been turned out unpainted. All previous ones are painted in the old London and North Western livery with "L. M. S." lettering. Five additional new ones will shortly be running in the new colours, and these will bear numbers from 7943 onwards (new numbering).

Engines recently broken up include two further passenger compounds, viz., Nos. 1955 *Hannibal* and 1979 *Nelson*; also No. 3373, a 0-6-0 tank. It is noteworthy that another passenger compound, No. 1915 *Implacable*, is being converted to "Renown" class.

No. 1870 ("G" class) has been converted to "G1" class (superheater) and renumbered 9267. It is stationed at Farnley (17 shed).

* * *

CONSTRUCTED at Derby, 10 new 4-4-2 tank engines, Nos. 2110-2119 are being placed in service on the London, Tilbury and Southend Section, Midland Division, London Midland and Scottish Railway. They correspond with other large standard series comprising the "Thundersley" class and the "Woodgrange" rebuilds, but have L.M.S. plates. Small tank engines previously bearing these numbers have been re-numbered in the 2200 series.

* * *

A NEW experimental type of automatic ticket machine has made its appearance at St. James' Park Underground Station. It is of "pull bar" design and its principal feature is that it can be easily adapted in a few minutes to supply 1½d., 2d., 2½d., 3d., 3½d., or 4d. tickets, as may be required. By this means it is possible to provide against any "rush" for tickets to a particular station with a range of a 4d. fare. Over 1,000 tickets per hour can be issued by this one machine.

Another "time-saving" device has been installed on the Underground at Victoria station. This is a new type of booking office "change plate" which enables passengers to quickly scoop up their change after purchasing their ticket. The edge of the plate nearest the passenger is bent upward in such a way that both ticket and change are easily picked up, even with a gloved hand. The possibility of coins rolling to the floor is also removed. The booking offices at Victoria are all equipped with the new "Rolltic" ticket-issuing machines. A recent test showed that well over 1,000 tickets an hour were issued by each machine during the rush period and in 500 instances passengers required change. These two improvements therefore effect a considerable speeding up in the handling of passengers at the booking office windows.

* * *

A FEATURE of the Southern Railway Exhibit at the International Shipping, Engineering and Machinery Exhibition at Olympia, which closed on September 22, was a fine model of Southampton Docks, constructed by Messrs. Marshall, Stewart & Co., of Upper Tooting. Built on a scale of 50 ft. to the inch, the model includes correct representations of the buildings, cranes, lighthouses, dolphins, &c., with passenger and goods trains on the quays and giant liners alongside. The work of construction has occupied much time, which will be understood when we mention that one of the numerous miniature buildings consists of 375 minute pieces of cardboard. Measuring about 10 ft. by 9 ft. 6 in. the model, which is mounted on a one-piece base, is supported by a handsome mahogany stand and enclosed in a plate glass case.

* * *

MR. C. R. CLINKER, writing from Rugby, points out that the Great Northern engines referred to on page 168 of the August RAILWAY MAGAZINE have, up to the present, only taken up one of the old Great Central workings, viz., that of the 8.55 a.m. Sheffield to Weston-super-Mare, and the 11.15 a.m. Weston-super-Mare to Sheffield. In both cases the Great Northern locomotive works the Sheffield and Banbury section. The locomotive now working this turn is an "Atlantic" type No. 280. It bears the Great Northern Railway shed number 1 (Doncaster), and the Great Central Railway shed letter "S" (Sheffield). A change has also been made in the coach working of these two trains. Last summer a Great Central and a Great Western set were employed alternate days, but now two Great Central sets are employed. The coaches of the 8.55 a.m. Sheffield to Weston-super-Mare work through to Wellington, returning on the 4.59 p.m., thence to Taunton, and by means of the 5.55 p.m. from Taunton, and the 7.27 p.m. from Yeovil, they arrive at Westbury, where the night is spent. Next morning they work on the 7.30 a.m. from Westbury and the 9.10 a.m. from Bristol to Highbridge, whence they return at 10.45 a.m. to Sheffield.

* * *

UNDER the title "Holiday and Health Resorts Guide," a very fine booklet has been

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issued by the London Midland and Scottish Railway. It is a development of the usual guide book, with descriptive notes by Mr. Basil M. Bazley, and includes particulars of hotels, boarding-houses, taxi and cab proprietors, leading tradesmen, &c., at places on or reached by services in connection with the London Midland and Scottish Railway. It deals more particularly with the Western Division (the old London and North Western and Lancashire and Yorkshire sections), but is also concerned to some extent with the Midland Division and the North Staffordshire and Furness sections, thus covering a considerable portion of England and the greater part of Wales. In the course of nearly 500 pages, printed on art paper and freely illustrated (with a folding map), this guide, which has an attractive cover in colours, should meet with wide appreciation and prove of great use to holiday-makers.

* * *

MR. T. H. DONOHUE points out in regard to remarks published in the July number that London and South Western coaches are now systematically used for the Brighton and Portsmouth services, Brighton dual-fitted engines being used as required. Owing to the fact that the Brighton–Cardiff–Ilfracombe–Plymouth – Bournemouth express avoids Portsmouth, the Brighton engine has worked to and from Eastleigh since July 9. The Bournemouth vehicles are detached at Fareham instead of Portsmouth.

* * *

A SERIOUS accident, causing the loss of several lives, occurred on July 6 on the main trunk line of the New Zealand Government Railways at Ongarue. The accident was due to a fall of earth on to the line. Possibly this would not have produced results so serious had it not been for the fact that a huge boulder fell with the earth, causing the engine to turn right over, the sudden check explaining the extensive damage done to the rolling-stock. The accident occurred at a place which is regularly patrolled in wet or stormy weather, but apparently the fall of earth occurred without warning. The train concerned was an express from Auckland to Wellington. The photograph reproduced below, for which we are indebted to Mr. N. Blake, shows a view on the line.

* * *

CANADIAN newspapers have given prominence to an interview with Sir Henry Thornton, the President of the Canadian National Railways, in which he predicts that within three years, barring an unforeseen disaster, there should be an end to the deficits of the Canadian National Railway system. Sir Henry Thornton explained that the different lines making up the Canadian Government system were formerly rivals, and were mostly weak and could not be co-ordinated and brought into harmony in a few months, but that progress was being made. The net receipts he added, were improving greatly and showed signs of continued betterment. Another three years ought to see the end to the succession of deficits. The consequences of failure would be to give the Canadian Pacific the whole system. "That," he said, "sounds feasible, but I do not believe the people of Canada would allow the Government to hand over the whole line to the Canadian

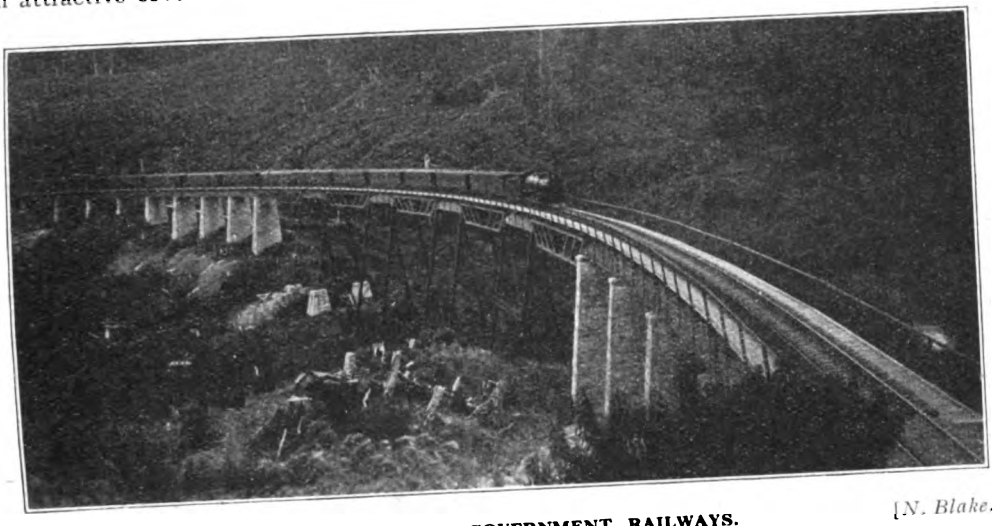

Photo.] NEW ZEALAND GOVERNMENT RAILWAYS. [*N. Blake.*

A scene not far from Ongarue.

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Pacific, and I doubt whether the Canadian Pacific would take it if it were offered."

* * *

In view of recent references to the running of the "Cornish Riviera" express leaving Paddington at 10.30 a.m., when divided, the following particulars of principal passing times, when scheduled to run through to Devonport, will be of interest. On such occasions the first portion neither calls nor slips at Westbury and conveys passengers for beyond Truro only. When thus operated the principal times are :—

		a.m.
Paddington	dep.	10.28
Southall	pass	10.39
Slough	,,	10.48
Maidenhead	pass	10.53
Twyford	,,	10.58½
Reading	,,	11.04
Newbury	,,	11.22
Bedwyn	,,	11.35
Savernake	,,	11.39
		p.m.
Westbury	,,	12.02
Castle Cary	,,	12.24½
Cogload Junction ..	,,	12.47
Taunton	,,	12.52
Exeter	,,	1.22
Newton	,,	1.46
Plymouth (North Road)	,,	2.29
Devonport Junction ..	,,	2.31
Devonport	arr.	2.32
	dep.	2.38
Truro	arr.	3.56
		p.m.
Truro	dep.	4.01
Gwinear	arr.	4.26
	dep.	4.28
St. Erth	arr.	4.36
	dep.	4.41
Penzance	arr.	4.52

* * *

In the work of replacing the signals on the Great Western Railway, it is significant to note that the new posts are generally much shorter than those which they supersede.

* * *

A notable event in the cross-Channel services between England and France is the withdrawal of the two paddle steamers, *Le Nord* and *Pas de Calais*, belonging to the Northern Railway of France. For 25 years these vessels have taken an important place in the Dover-Calais services. They were favourites with many passengers, by reason of their steadiness in heavy seas, even as compared with the modern turbine steamers employed by the English company in association. These old boats have been replaced by the triple-turbine steamers, *Invicta* and *Empress*, originally owned by the South Eastern and Chatham Railway, but now transferred to the Northern Railway of France for maintaining that Company's share in the cross-Channel services. We are informed it is not proposed to change the names of these vessels, although they are now flying the French flag.

POSTER ISSUED BY THE NORTHERN RAILWAY OF FRANCE, ILLUSTRATING ONE OF THE PADDLE-BOATS REMOVED FROM CROSS-CHANNEL SERVICE RECENTLY.

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THE RAILWAY MAGAZINE.] [*Photo by W. J. Kohning.*

EALING—SHOEBURYNESS VESTIBULED CORRIDOR EXPRESS

LONDON MIDLAND AND SCOTTISH AND METROPOLITAN DISTRICT RAILWAYS

Worked by L. M. S. (Midland) Express Tank Engine No. 2149

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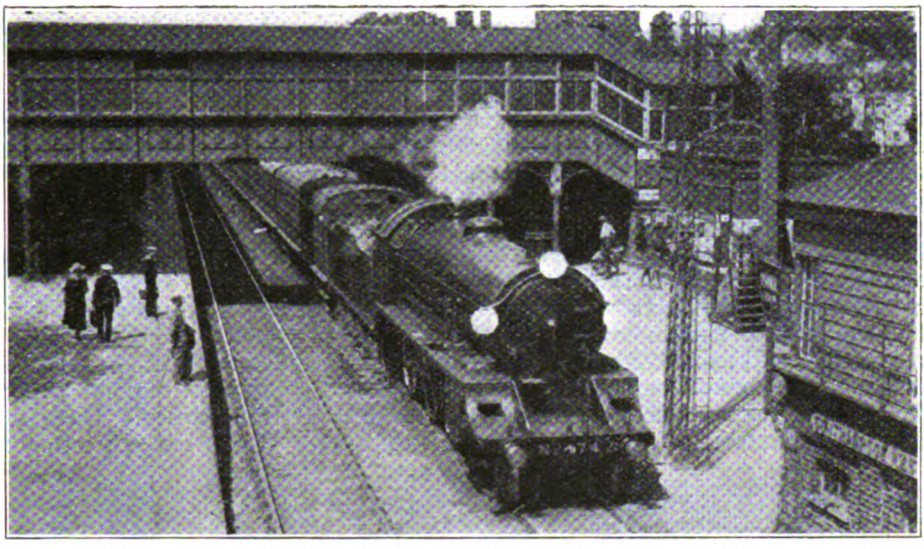

Photo.] [*R. Murphy.*

BOURNEMOUTH-WATERLOO EXPRESS AT SOUTHAMPTON WEST.
4–6–0 Locomotive No. 742.

Southampton West Station (Southern Railway) and its Traffic.

By J. THORNTON BURGE.

SOUTHAMPTON as one of the greatest of railway-owned ports in Great Britain, and as a leading industrial, trading and shipping centre, has received attention in these pages on many previous occasions. For the present attention is therefore confined to the railway facilities, and particularly those associated with the station known as Southampton West.

The Terminus, Town or Docks station, as it has been variously titled, was originally the principal Southampton station, but has gradually lost its premier position, and at the present time is little used for important passenger traffic; nearly all the trains running into it being either local or slow. With its decline, Southampton West has developed enormously, until it has absorbed practically the whole of the long-distance traffic from and to Southampton.

Some idea of the extent of the traffic at Southampton West station may be gleaned from the fact that in a year nearly 3,000,000 passengers, 97,266 parcels, 51,000 milk churns, 51,000 cloakroom tickets, 100,000 telegrams, 11,000 tons goods, 25,568 tons coal and minerals, 6,297 loaded wagons and 9,980 excess receipts were dealt with. These totals do not include the large transfer of traffic to and from the various connecting trains, nor the tickets which are issued on board ships, and at the offices in the Docks and town. The weight of luggage dealt with runs into thousands of tons yearly.

When the L. & S.W.R. opened their railway to Dorchester in 1847, the main business portion of Southampton lay in the neighbourhood of the Docks, and the present Terminus station was therefore in the best position to command traffic. But as time went on, Southampton gradually grew in the only possible directions, to the north and west, and business,

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except that almost exclusively pertaining to shipping, left the southern portion and came west. The first station to supply this western part of Southampton was a small wayside affair, situated practically on the mudlands of the western shore, and bounded more or less on the north by market gardens. This was called "Blechynden," and the staff consisted of a stationmaster and two or three men. But as the town grew it became necessary to build a larger station, which at first retained the old name "Blechynden," but eventually became "Southampton West." This was a much larger station than the first, and contained on the up line side a stationmaster's office, booking office, parcels office and cloak room, two fairly good waiting rooms, a booking hall and a cab yard for four cabs. These offices were protected on the line side by a verandah, but no other covering was provided on the up platform. On the down side there was a small covered waiting shed, while a footbridge connected the two platforms. The staff then consisted of a stationmaster, two booking clerks, a ticket collector, two signalmen, two parcels porters and five porters. The train service was principally to and from Weymouth and London, with connections to Bournemouth *via* Ringwood until 1888, when the direct line was opened to Bournemouth *via* Sway. Then only one or two of the fast Bournemouth trains stopped, practically the whole of the traffic for Southampton being dealt with at the Terminus station. At that time there were no M. & S.W. Junction trains *via* Southampton West, and no trains to and from Portsmouth *via* Netley. For goods traffic, two small sidings were provided and found sufficient. The stationmaster lived in a small cottage at the northern end of this goods yard.

The West Park Road of to-day, and the site of the present Grammar School, was then a market garden. There were no Electricity Works nor any other factory on the western shore. The latter was a promenade open to the River Test. One of the staff of that day, Foreman Collector Arnold, writes as follows, reminiscent of those days :—

"In times of storm when we had high tides and a south-west wind, I remember very heavy seas, and the water came into the station almost sufficient to float a small boat. Once a bull escaped from the Southampton Town station cattle-pen and ran down the line through the tunnel to the old West station, and two porters had to jump from the line to the platform to escape being gored ; the bull ran through the crossing gates and rushed into the sea and was there a considerable time

Photo.] GENERAL VIEW, DOWN SIDE. [*T. Gordon.*

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swimming about, but it was rescued after it got tired out."

When, however, the fast trains to and from Bournemouth began to stop and new routes with through train services were inaugurated to South Wales *via* Salisbury, Portsmouth *via* Netley, Birkenhead *via* Basingstoke and Cheltenham *via* Andover, the Southampton West station of those days became altogether too small to deal with the traffic, and Southamptonians began to desert the Town station for the West, where they could get quicker and more convenient train services. In addition to this, the shipping increased and cost many thousands of pounds, and was opened on November 5, 1892, amid much rejoicing. The local papers proclaimed it as one of the best and most commodious on the L. & S.W.R., descanted on its wide and long platforms, its waiting rooms and offices, and apparently considered it would accommodate the traffic in the west of Southampton indefinitely. But it had not been opened many years before this fallacy began to be felt, in that many of the rooms and offices were found too small to meet the demands of the increased traffic which began to flow to the new station. The

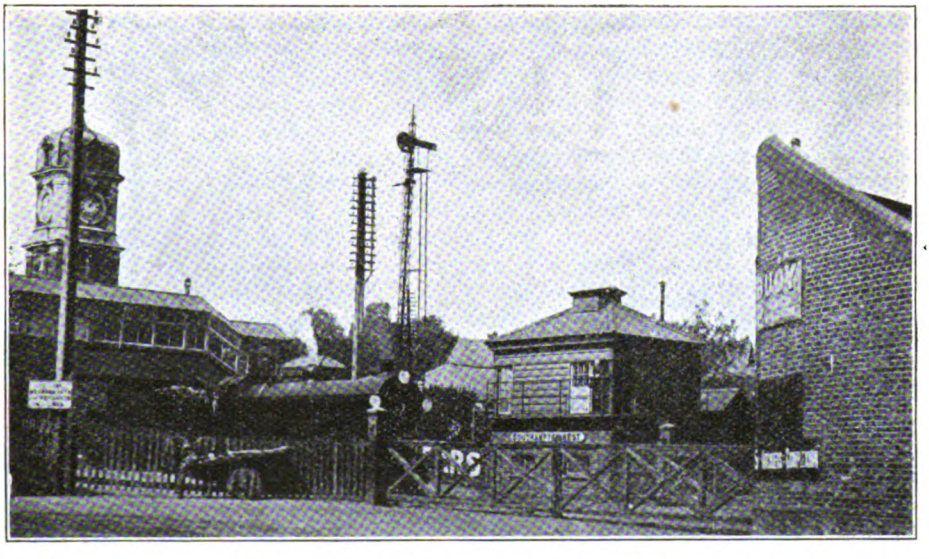

Photo.] **LONDON EXPRESS AT SOUTHAMPTON WEST.** [*R. F. C. Tear.*

Showing level crossing, signal cabin and clock tower.

every year more traffic from the Docks had to be accommodated by rail.

In these circumstances, the Directors resolved on building a new Southampton West station, which they considered would be big enough to accommodate the traffic to be dealt with here for all time. After many plans were prepared and discussed, it was eventually decided that the new station should be built at the extreme western end of the old station and on the opposite side of the road crossing. To do this a tract of mudland on the northern bank of the River Test was reclaimed.

The new Southampton West station sidings were not found large enough, and many alterations and additions had to be made.

The present station is built of red brick, with terra-cotta facings, the whole being roofed with red tiles and surmounted by a clock tower, lighted at night, about 100 ft. high. The tower is entered from the telegraph office by means of a series of steps with landings; from the windows a fine view of the surrounding portions of the town are obtained. The whole structure is supported on concrete foundations 30 ft. deep. A spacious cab yard is provided on the up side, and on the down side a smaller yard.

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At the western end of the cab yard on the up side is the Central District Traffic Superintendent's office, as Southampton West is now the traffic headquarters for the district, comprising within its boundaries the lines from Salisbury to Portsmouth, Weymouth and Andover. The District Superintendent's office is a commodious building erected about 12 years ago, and comprises on the ground floor an enquiry and telephone office, staff office, statistics office, excursion department, special notice department, district inspector's office, goods train office and staff lavatories. On the upper floor are the District Superintendent's, Assistant Superintendent's and Chief Clerk's offices, train running office, general office, parcels department, waiting room, &c. The staff in this office numbers approximately 38 clerks, with four messengers, under a District Superintendent (Mr. Milford), with an assistant (Mr. A. Holmes). A system of automatic telephones is installed connecting this station with the company's exchanges at Southampton and Eastleigh, thus linking up with most of the railway, dock and shipping offices in the district and also with the National Telephone system.

The up platform is 600 ft. long and approximately from 20 ft. to 40 ft. wide. It will accommodate a train consisting of an engine and 11 bogie coaches. At the extreme eastern end is the east ground frame. The buildings abutting on the up platform comprise: parcels office, cloak room, refreshment rooms, booking office, telegraph office, bookstall, general waiting room, ladies' waiting room, stationmaster's office and lavatories at each end of the buildings. Although most of these buildings are of fair dimensions the traffic has quite outgrown them; plans have been drawn up from time to time for the enlargement of the parcels office and cloak room, the refreshment rooms and the booking halls, but up to now the work has been delayed, owing to the excessive cost of enlarging. There is also urgent need for better train and siding accommodation, and the construction of an entirely new station, or a large extension of the present one, is contemplated, and will probably be taken in hand in the near future.

SOUTHERN RAILWAY STEAMERS IN SOUTHAMPTON DOCKS.

The signal-box controlling all traffic movements is at the eastern end of the up platform. A footbridge connects the two platforms at this end of the station. Adjoining this platform at the eastern end of the station is the old Y.M.C.A. West Station Hut, a commodious building which was largely patronised during the war by Service men on their way to and from the battlefields of France and the Eastern theatres of war. It has since been pur-

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chased by the L. & S.W. Railway, and is now used by the Docks Sports Club and converted into an institute for the use of the Dock employees.

The down platform is 800 ft. long and approximately 20 ft. to 40 ft. wide, and is therefore, able to accommodate the longest trains, consisting of an engine and 15 bogie vehicles. This platform is also provided with a bay road at the western end 501 ft. long, for the use of local and other trains which shunt or start from the station in connection with the various fast services. The buildings on this platform comprise parcels office and cloak room, ladies' waiting room, refreshment tea rooms and buffet, booking office, booking hall, general waiting room, bookstall, public and staff lavatories, porters' room, inspectors' office, ticket collectors' office, &c. Most of these rooms and offices are fairly spacious, with the exception of the parcels office and cloak room, which are inadequate for the traffic at present dealt with on the down side. At the eastern end of each platform are exit gates for passengers. These gates are also used for the exit and ingress of all luggage and goods.

The station is a "closed" one. The ticket-collecting staff consists of a foreman and eight collectors, one of whom travels on certain fast trains. The total revenue derived from penny platform tickets at this station is second only to that at Waterloo.

Both platforms are protected by the umbrella type of verandah, that on the down side, which is most exposed to the sea, being extended to a total length of approximately 500 ft. There are water columns on each of the platforms fed from a huge tank fixed on pillars at the entrance to the goods yard. A horse-box and carriage-loading dock is provided at the southern end of the down platform, with a loading space of 66 ft.

The level crossing at Southampton West station has been a source of contention and trouble for some years, and a constant newspaper agitation has been levelled against it. The road traffic is very heavy, and the turning from the Western Shore Road across the line to Blechyenden Street is a dangerous one. Plans have, on many occasions, been prepared to obviate this level crossing by regrading the road and carrying it across the railway by means of a brick viaduct, but up to now the expense has been considered too heavy. It will, however, have to be faced in the near future as the traffic, both on the road and on the railway, is increasing, and when the new docks are completed will be much heavier. The crossing is situated at the extreme eastern end of the passenger platform and practically cuts off the passenger portion of the station from the goods yard shed and offices. The gates are worked mechanically from the signal-box. The gates are opened and closed about 150 times daily; the actual number when the last census was taken was 292 times.

Considering the fact that this station deals with the largest passenger traffic outside Waterloo, it is worked most economically so far as the staff is concerned. This comprises stationmaster, two inspectors, stationmaster's clerk (who also deals with inquiries and assists in the booking), a chief booking clerk, four junior booking clerks, four female telegraph clerks, messenger, one parcels clerk, two goods clerks, three signalmen, one foreman collector, seven station collectors, one train collector, one excess luggage collector, two leading parcels porters, five parcels porters, two checkers, two shunters, one leading porter and ten porters. The latter work split turns of duty. In addition, there are two outside porters for the delivery of luggage who, although attached to the station, are not paid by the company.

The stationmaster, Mr. J. T. Burge, joined the service of the L. & S.W.R. in January, 1878. He served as a clerk in various capacities from then to July, 1891, when he was promoted to clerk in charge at Plymouth North Road for the London & South Western Railway Company, and in September, 1898, he became stationmaster at Bow (Devon), transferring to North Tawton five years later. He then had charge of Yeovil Town and Templecombe Junction stations, coming to Southampton West in September, 1914. The jurisdiction of the stationmaster at Southampton West practically commences at Tunnel Junction, at the point where the Main Line Traffic Superintendent's district adjoins that of the Central District. Tunnel Junction Cabin itself is in the main line district, and therefore is under the

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supervision of the Southampton Town stationmaster. This cabin has 14 levers and controls all traffic to and from the main London to Bournemouth line and that to Southampton Town.

The goods yard extends from the mouth of the tunnel westward to the present passenger station. It includes the old Southampton West passenger station with the exception that portions of the passenger platforms have been removed. There are two good mileage roads and a siding on the down side. These are capable of dealing with 50 loaded wagons for unloading purposes at a time and are always empties and loaded traffic, the load averaging from 25 to 30 wagons. There is no separate goods shed, but the old station buildings are used for the purpose of offices and stores for road, box and other goods. These buildings provide two goods offices (one used by the clerks, the other by the checkers), a large outside and an inner store and a gas lineman's workshop.

In cases when the traffic is not large enough to warrant special boat trains to London coaches are worked out specially from the ship's side to Southampton West station, and then attached to the fast trains. The same arrangement also ap-

Photo.] **PART OF STATION STAFF, SOUTHAMPTON WEST.** [*T. Gordon.*

Stationmaster in centre.

full. There is a loading dock with a cattle pen adjoining, and two short shunting necks on the up side, also a short road leading from the down main and connected with the Corporation Electricity Works. The tonnage dealt with last year (1922) was 12,342 tons goods, 25,966 tons of coal, and 2,895 tons of other minerals in addition to live stock. The whole of the coal for the Corporation Electricity Works is dealt with here, together with a large proportion of the traffic for Pirelli's Cable Works and other factories and firms in the neighbourhood.

A goods train leaves Southampton West every evening at 4.10 p.m. with

plies in the case of outgoing passengers, the vehicles being worked to Southampton West by ordinary fast trains and from there "specialled" to the ship's side.

The Station box contains 23 levers, of which 21 are in work. In addition, there are three telephones. Sykes' lock and block signalling is in operation both on the up and the down lines. Electric repeaters are affixed to practically all the important signals. The line from the down starting signal to the down advance is track circuited, and this affects both the bay road and the west cross-over road at the fouling points. There are three crossover roads, one at the east

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end 190 yards from the signal-box and worked from the East ground cabin, a middle crossover road in the station worked from the signal-box, and one at 427 yards to the west of the signal-box worked from the West ground frame.

The Station box is a busy one. One man only is on duty at a time, the shifts being of eight hours' duration. At the last census the lever movements per day were 1,815 during the summer months, and 1,519 during the winter. In addition to this, the signalman does his own booking, attends to the telephone, and works the crossing gates.

The West ground frame contains 22 levers, of which 19 are in use. This frame practically controls the whole of the movements at the western end of the station. These various movements are controlled both by mechanical and electric interlocking in the ground frame and from the Station box, and the signals controlling the down bay line are slotted from the signal-box so that the man in charge of the ground frame acts under the control of the signalman in the Station box.

The East ground cabin is 180 yards from the Station box, and 150 yards from the Western mouth of the tunnel. It contains 12 levers, all of which are in use. This cabin is principally for the control of the goods yard, the Electricity sidings and the east crossover road.

The working to and from the Electricity sidings is unique. The Corporation Electricity Works are situated on the opposite side of the Western Shore Road to the railway, and all wagons, loaded and empty, have to be hauled across the main road by an electric motor to and from the works. A short siding on the down side at the eastern end of the Southampton West goods yard accommodates the wagons, eight of which can be put into this siding at one time. The loaded wagons are taken from here by the electric motor and when empty brought back. This motor generally hauls three loaded wagons across the road at one time and could do more if the curves were not so sharp.

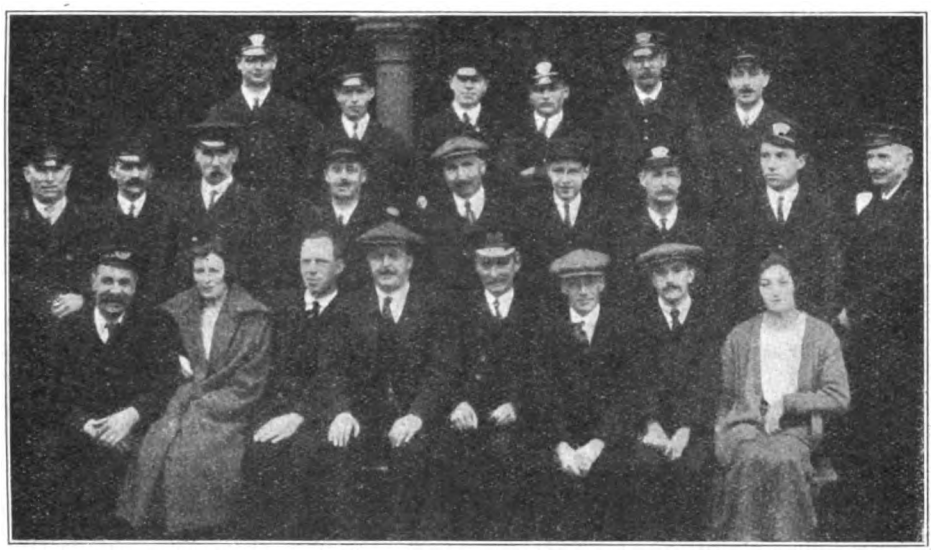

Photo.[ANOTHER GROUP, SOUTHAMPTON WEST [STATION [STAFF. [*T. Gordon.*
Stationmaster in centre.

The regulations laid down by the Board of Trade for working wagons to and from this Electricity siding are as follows :—

The Southampton Corporation has to provide a flagman to accompany all traffic between the points named. He is provided with a red flag, and, before any movement is made, rings a handbell to warn all road traffic that traffic is about to be passed across. The regulations provide that the motor must not travel at a speed greater than four miles an hour ; it must not proceed from the Electricity

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sidings across the public road until the railway company's shunter gives permission, and while in the railway sidings it is in charge of the railway company's shunter, although driven by the Electricity Works driver. As far as possible, the work to and from the sidings must take place between 11 a.m. and noon, and from 3 p.m. to 4 p.m., but the shunter in charge is left free to arrange with the foreman at the Electricity generating station as to the best times of crossing.

During the War, Southampton West came very much to the front from the fact that from it a military line terminating at a large jetty was constructed round the Western Shore. Here the train ferries conveying loaded wagons to and from French Ports embarked and disembarked their cargoes. Large marshalling yards were constructed, and the ferries worked regularly to and from France. Each boat accommodated a train of from 35 to 55 wagons. These were run off on to the French railways. On their return the empty trains were worked specially from Southampton West to the various depôts and dumps in England for reloading. The boats took approximately 24 hours from the time they left the jetty at Southampton, discharged their trains at Dieppe, embarked their empty trains, and returned ready for another trip from the West station. The whole of this military railway has now been taken up and only the jetty remains.

Southampton West also played an important part during the war in other ways. The numbers of troops entraining and detraining here reached notable totals, while special arrangements were made to unload heavy military material, guns, &c., in case of a blockage at the Docks. Some hundreds of train loads of German, Austrian, Turkish and Bulgarian prisoners were entrained and detrained here, and the station throughout the War was more or less garrisoned by troops and was the headquarters of the National Defence Corps, one of the waiting rooms being requisitioned for the purpose of an office.

The train service to and from Southampton West is good. Every up and down ordinary train stops at this station, several trains originate and terminate here, while local services are timed to connect with the fast trains. There is an hourly fast service to and from London and in the summer months this is augmented by relief trains. There are through corridor restaurant trains to and from Birkenhead, Chester, Birmingham, Manchester, Newcastle, Nottingham, Leicester and Sheffield *via* Basingstoke and Oxford, to Exeter and Plymouth *via* Salisbury, and to Dover, Folkestone, &c., *via* Guildford. Through trains and coaches run to Cardiff, Bristol, Bath and Weston-super-Mare, *via* Salisbury; Birmingham *via* Basingstoke; Cheltenham, Swindon, &c., *via* Andover Junction; and Brighton *via* Havant, in addition to the main line and cross-country local services to Weymouth, Bournemouth, Swanage, Salisbury, Andover, Basingstoke, Waterloo, Guildford, Portsmouth, &c.

To facilitate the transit of luggage to and from Southampton West station and the Docks the railway company inaugurated a motor lorry service whereby passengers arriving by any of the trains at the West station are met by the railway company's baggage master, and luggage conveyed by motor van to the sheds alongside the ships. On the other hand, all the liners and cross-Channel boats are met at the Docks by the railway company's motor vans and the luggage conveyed to the railway station, where it is placed in charge of the luggage man until claimed by the passengers. The charge for this service is one shilling per package to and from the liners, and free conveyance for all luggage to and from the railway company's boats and the station. A checked luggage arrangement is in operation to ensure passengers getting their correct luggage. This consists in the issue of numbered checks, one portion of the "check" being given to the passenger and the other attached to the luggage. The passenger retains his portion of the check until he is in possession of his luggage either at the ship's side or at the railway station as required.

In addition to this a motor 'bus conveying passengers and luggage meets the principal trains and boats in connection with the boat service to and from Cowes by the Isle of Wight Steamship Company's steamers.

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A TYPICAL SCENE IN THE FAR NORTH, MYRDAL STATION.

The Bergen-Christiania Railway.

By J. S. DOW.

THE Bergen-Christiania Railway, connecting the two largest cities in Norway, is a remarkable piece of engineering work and differs in some respects from any other railway in the world. Some of the Swiss railways reach higher altitudes, and some railways in the United States involved greater constructional difficulties and dangers from avalanches and falling rock. But this railway in Norway is remarkable, not only for height ascended, but for the high latitude and difficult climatic conditions in winter. Alpine railways in general penetrate the mountains mainly by tunnels and are exposed to wintry conditions only for relatively short lengths over passes. But the Norwegian line runs for 60 miles over a high plateau above the tree limit, where snow lies deep in winter and winds of considerable power are met with.

The total distance from Bergen to Christiania is 306 miles, and the journey occupies 12-14 hours. The complete connection over the Hardanger mountains was only established in 1909, though the line formerly ran a considerable distance from the two extremities. Travelling from Bergen one meets with the most interesting variations in scenery. For the first part of the journey the line passes by the edges of fiords and through deep wooded valleys. Frequently the route passes between steep cliffs, falling stones from which require watchfulness and careful supervision. After leaving Voss there is a steep ascent, the average inclination over this region being about 1 in 45, until the highest point on the line is reached at Taugevand, over 4,000 ft. above sea-level. Here there is snow all the year round, and a lake which is almost invariably frozen over. One of the most marvellous views on this part of the line is the aspect down the Flamm valley near Myrdal, where the train habitually stops for a few minutes in order that travellers may admire the view!

Finse, a little further along the line, is also famous for the vast expanses of snow and the great glacier. The hotel at this point is stated to be the highest in northern Europe, and this is one of the few readily accessible places where the ski can be used on the snow all the year round. From this point onwards the line descends again,

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A SNOW CUTTING.

ENTRANCE TO TUNNEL.

WINTER VIEWS ON THE BERGEN-CHRISTIANIA RAILWAY.

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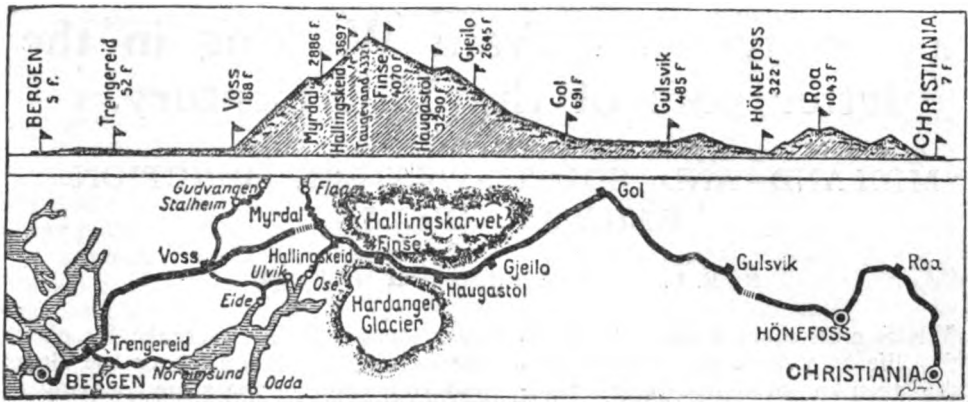


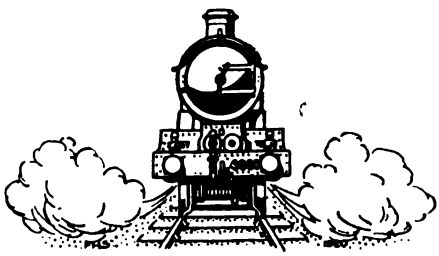
PROFILE AND MAP, BERGEN-CHRISTIANIA RAILWAY.

and the traveller ultimately finds himself in the fertile low-lying land round Christiania.

As can readily be imagined, the preservation of regular service, with such steep inclines and so many tunnels and bridges, amidst the whirling snow of winter, is not easy. The large and very powerful locomotives in use invariably impress even non-technical passengers, and in winter the high sections of the line, and especially the tunnels, have to be kept clear by special clearers in the front of the engine and rotary fans behind. The carriages are exceptionally comfortable, a pleasing feature being the use of detached cushions at the sides, which passengers can arrange to suit their convenience. Although oil lamps are used in some of the older carriages, electric lighting is now general and the arrangements in first-class carriages are very complete. A novel arrangement is the provision of a completely wired portable lamp which can be connected by plugs at various points in the carriage according to the desire of the traveller; this is supplementary to the main central lighting. Another feature is that sleeping cars are provided not only in the first and second but also in the third class.

The journey is familiar mainly to British tourists by reason of the many delightful centres to which it gives access. But it should not be overlooked that the line also furnishes a direct connection to Stockholm, Helsingfors and Petrograd, and thence to Vladivostock and China. During the war this furnished a most valuable line of connection, the usual overland route being blocked by enemy countries.

It is one of the most pleasing features of Norway that travelling either by railway or by steamers on the fiords is a source of enjoyment. Generally speaking, journeys present little difficulty to British tourists, whose path is smoothed by the services of one or other of the travel bureaus which have done so much to make Norway familiar to English people.



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Locomotive and Train Working in the latter part of the 19th Century.

MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY. [No. I.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

THIS cross-country railway started life as a small and obscure line, then known as the Swindon, Marlborough and Andover Railway, and was possibly intended merely to cross the Wiltshire "Divide." For this county is divided into two almost completely separate portions by the long range of somewhat bleak downs which run almost due east and west. Before the new railway was opened in 1881, the traveller in North Wilts who wished to visit South Wilts usually hired a trap or a farmer's cart, for other convenient means of communication did not exist. If he insisted on travelling by rail, he could do so, either by going to Reading towards the east and doubling back along a railway some miles to the south of the downs parallel to his former route, or by performing a similar circuitous journey in the opposite direction *via* Holt Junction near Trowbridge. And all this only took him through Mid-Wilts, for it required similar circuitous journeys *via* Basingstoke on the east, or Westbury on the west, to enable him to reach Salisbury. The trains over these routes were few and far between, and of that slow variety which made the blades of grass in the fields appear nearly as far apart as quarter mileposts.

The Swindon, Marlborough and Andover Railway cut right across the Wiltshire downs from north to south, and opened up a direct route across the county. The section from Swindon to Marlborough was opened in July, 1881, and the line extended about a quarter of a mile beyond the S.M. & A. station to a junction with the Great Western branch between Marlborough and Savernake, the latter having a length of about 5½ miles. This Great Western branch was used by all the S.M. & A. trains, which then continued their journey from Savernake for about three-quarters of a mile over the Berks and Hants line of the same company to Wolfhall Junction, where the S.M. & A. diverged to the right for Andover. The total distance from Swindon to Andover was 33 miles. The section from Grafton, about 1½ miles from Wolfhall Junction, to Andover, was opened in May, 1882, and trains using the intermediate link began to make the through journey in February, 1883. North of Swindon Town (Old Swindon), the principal station on the line, the railway extended to a junction with the Great Western main line at Rushey Platt, 1½ miles west of Swindon Junction (G.W.R.) station, and in the earliest days of the line the passenger trains of the S.M. & A. started from the Great Western station, a practice which was shortly afterwards discontinued.

The Swindon and Cheltenham Extension Railway, which was intended to connect with the Midland Railway at Cheltenham, was partially opened from Rushey Platt as far as Cirencester, where it then came to an abrupt termination for the time being, owing to want of funds. This section was opened in December, 1883, the distance from Swindon being 15 miles.

The whole line throughout from Cirencester to Andover was single, except at the crossing stations, and was laid with flat-bottomed rails spiked directly to transverse sleepers. The Great Western section from Marlborough South Junction to Wolfhall Junction was laid with the old longitudinal sleepers, always known as the "baulk road."

The first three locomotives, Nos. 1 to 3, built in 1881 by Dübs & Co., were small 0-6-0 goods side tank engines with outside cylinders, 15½ in. by 22 in., and 4 ft. wheels. Their chief external characteristics were large copper-capped chimneys,

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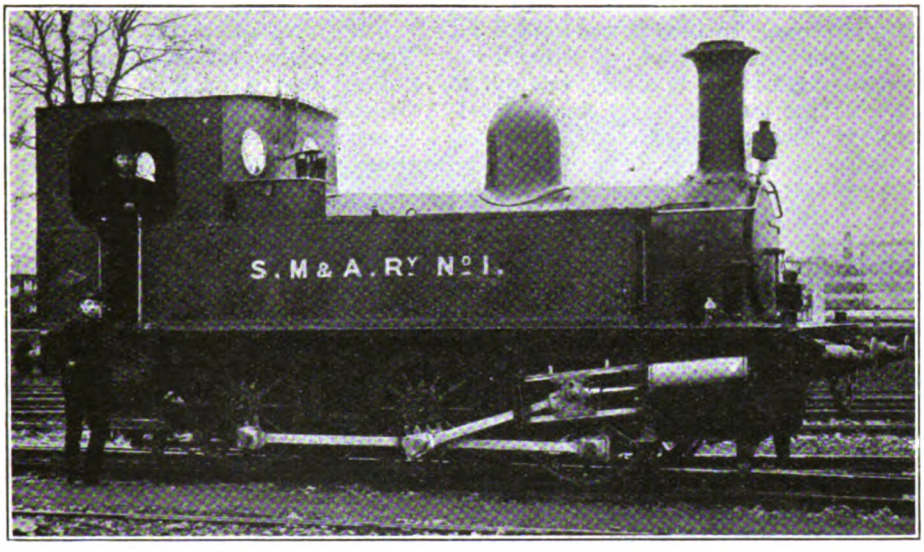
round-topped domes, Ramsbottom valves, and long side tanks, which extended to the back of the smokebox. No. 4 was the only passenger tank engine when the first portion of the line was opened, and, being a species of railway "pantechnicon," merits a special description. It was a 0-4-4 side tank engine of Fairlie's double bogie pattern, but with a single boiler of the ordinary type. The coupled wheels formed a swivelling bogie at the leading end, and had a diameter of 5 ft. 6 in., whilst the trailing bogie under the footplate was of the ordinary type but with somewhat large wheels, 4 ft. diameter.



0-6-0 TANK ENGINE, SWINDON, MARLBOROUGH AND ANDOVER RAILWAY.
Built by Dübs & Co., 1881. Coupled wheels, 4 ft. diam. Cylinders, 15½ in. by 22 in.

The cylinders, 16 in. by 22 in., were outside, with the steam chests on the top, the latter being inclined downwards towards the outside. But No. 4's greatest claim to celebrity lay in that it was the first and at that time the only engine in this country to have Walschaerts valve gear, which was placed outside. The chimney had a large copper top, and the firebox casing was raised and surmounted with a pair of Naylor's safety valves. The Walschaerts valve gear, when I first saw the engine lying by in 1885, was a complete novelty to me, and after trying to puzzle it out, I gave it up for the time being. And I am not sure whether the loco. foreman, who had charge of the few engines at Old Swindon shed, made very much of it either, for, after tinkering with it for some time, he voted the whole thing a "confounded nuisance," though he afterwards confided to me that it might have its good points, but what he thought these were he did not divulge. However, he may certainly be excused, for your readers can imagine the feelings of a man brought up to the orthodox link motions of that day on being suddenly set down in company with the one and only Walschaerts motion in the country, without the provision of any explanation or diagram of its working. The engine was not new when the Swindon, Marlborough and Andover Railway came into possession of it. It bore a plate inscribed "Fairlie Engine Co., Ltd., London," but though built to the orders of Mr. Fairlie's firm, it had apparently come from the works of the Avonside Engine Co., of Bristol, who constructed it in 1878 for the Paris Exhibition of that year, after which it vanished, until the S.M. & A. were persuaded by somebody to buy it.

And a thorough "white elephant" it proved. I cannot say whether my acquaintance, the shed foreman, set the valves, certainly he never confided to me

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that he did; but possibly the engine had other deeply rooted eccentricities. Certain it is that it burnt an average of about 45 to 50 lb. of coal per mile, and the S.M. & A. was far from being in such a flourishing position that it could stand this sort of thing very long, especially with light trains of about five or six four-wheeled coaches. Therefore, shortly after Beyer, Peacock & Co. had built some new tank engines, No. 4 was relegated to a siding at the engine shed, where it stood for some years, except for an occasional trip, when everything else in the engine line was on the sick list. But it served well as an object of reverent interest to myself and a friend, who was also addicted to locomotive curio hunting. In 1888 it was hauled out of its quiet retreat and, no other locomotive power being available, was put to work on the local exchange traffic goods between Swindon Town and Swindon Transfer (G.W.R.) for a few weeks, and then retired once more, having "done its bit." Finally, about 1892, it disappeared and, I believe, was broken up.

In 1882, three passenger tank engines, Nos. 5, 6 and 7, came from the works of Messrs. Beyer, Peacock & Co. These were 2-4-0 side tanks of a pattern long associated with this firm, and almost similar to some which they had constructed in 1877-78 for the Dutch State Railways. They had 5 ft. 6 in. coupled wheels, inside frames throughout, and inside cylinders 16 in. by 24 in. Their external characteristics, with curved domes of polished brass and copper-capped chimneys tapered to a smaller diameter at the top, showed their origin. These were followed in 1884 by another 2-4-0 side tank engine from the same firm, No. 8, which, however, was somewhat larger than the No. 5 class, and had a different arrangement of frames. This engine had outside framing for the leading wheels and always appeared to me, from my experience on the footplate of both it and No. 6, on both of which I made several trips between Swindon and Andover, to be the steadier and better "riding" engine. No. 8 had 17 in. by 24 in. cylinders, 5 ft. 6 in. coupled wheels, and a wheel base of 16 ft., as compared with the 14 ft. 6 in. wheel base of the No. 5 class.

The train services during the 'eighties may be divided into three. Firstly, there were the "main line" trains, four in each direction, which ran between Swindon Town and Andover, stopping, of course, at all intermediate stations. The chief interest on this journey was in getting over the Great Western length between Marlborough and Savernake, for this, too, was a single line, and had to accommodate the shuttle service of the G.W.R. between the two places, in addition to the M. & S.W.J.R. trains. Here I must explain that, in 1884, the Swindon, Marlborough and Andover and the Swindon and Cheltenham Extension lines had amalgamated as the Midland and South Western Junction Railway, the title by which the railway is now known.

Returning, after this digression, to the Marlborough and Savernake section, I noticed that it used to happen that the Great Western shuttle train often managed to occupy the single line when the Andover train wanted to get on to it, and as the shuttle train had the train staff, there was considerable delay before this got back again or a ticket was forthcoming. If all the trains of both companies had managed to keep to the strictly cast-iron schedule as set forth very carefully in the working time-tables, no great harm would have resulted, but I think it was the superabundance of milk churns that upset arrangements. The traffic in milk churns bulks very largely and is extremely important in this part of the country.

The trains over the main line were worked by the 2-4-0 tank engines Nos. 5 to 8, of which Nos. 6 and 8 were stationed at Swindon, and one of the others at Andover. One Swindon engine worked two daily trips each way, and, if I remember rightly, another engine worked one trip each way with part of the goods service. Part of the goods service was worked by one of the 0-6-0 side tank engines.

On the Swindon-Cirencester line there were only two "mixed" trains in each direction, which did not connect with the Andover trains at Swindon. In fact, passengers were of little account on this section, for having, perchance, sampled one of the two "mixed" trains, and spent a very wearisome time on the journey, they did not come a second time, but went by Great Western from Swindon to Cirencester, and by the farmer's cart if they wanted to get to Cricklade. But it was

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really milk and farm produce that formed the mainstay of the traffic on this section, and until the opportunity arrived for opening the extension to Cheltenham, the company really did not expect to get any benefit from passenger traffic. These mixed trains were worked generally by Nos. 5 to 7 and occasionally by Nos. 1 to 3.

The third series of trains consisted of the goods trains, which conveyed through traffic from the M. & S.W.J.R. stations, and also from certain L. & S.W.R. districts to the Great Western line. The northern extension from Cirencester was opened to Andoversford Junction on the Great Western Banbury and Cheltenham line, over which the Midland and South Western Junction Railway ran to Cheltenham. The distance from Swindon Town to Cheltenham (Lansdown) is 35¾ miles, of which 7 miles from Andoversford Junction belong to the Great Western and the last quarter of a mile to the Midland.

The extra trains and the new line gave the M. & S.W.J.R. a locomotive problem to solve, for there had been no new engine

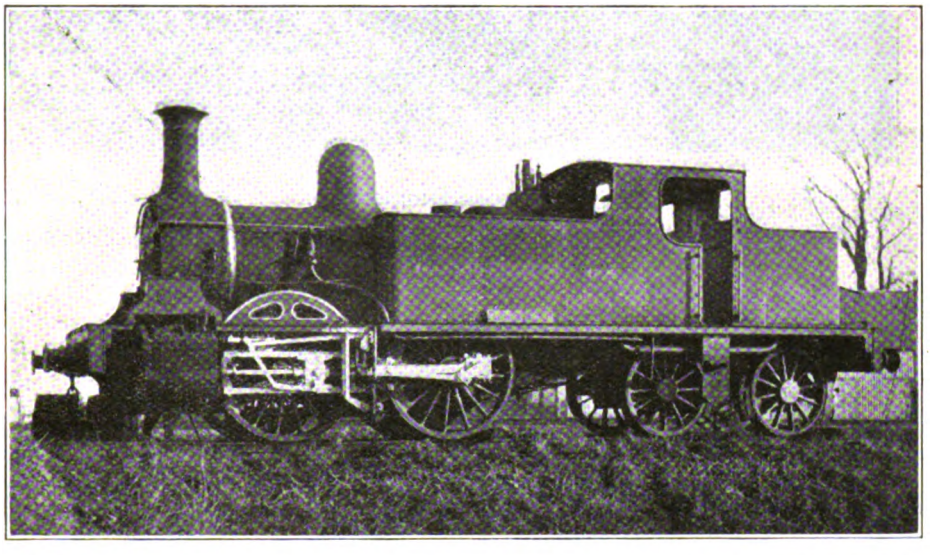

Photo. by] [*R. E. Bleasdale, Warwick.*

0-4-4 DOUBLE-BOGIÉ (FAIRLIE) TANK ENGINE No. 4.

Coupled wheels 5 ft. 6 in. diam. Cylinders, 16 in. by 22 in. This is the first engine fitted with Walschaert valve gear to work on a British railway.

trains left Swindon Town twice a day, ran on to the Great Western main line at Rushey Platt Junction, thence through Swindon Junction to the "Transfer," about three-quarters of a mile east of the Great Western station. They returned with traffic for the opposite direction, and were almost invariably worked by the three six-coupled tank engines Nos. 1, 2 and 3, except, as stated previously, when No. 4 was for a time disinterred and brought into service.

In the early summer of 1891 there was an additional passenger train in each direction between Swindon and Andover, and on August 1 of the same year the since 1884, and the stock still consisted of seven workable locomotives, omitting the "white elephant," No. 4. To get the company out of this dilemma the London and South Western was appealed to, and provided one or two of the older Beattie 2-4-0 tender engines. Such help was, however, by no means a novelty, for it had been given on previous occasions, such as in 1887-88, when the L. & S.W.R. 6 ft. coupled "Beattie" No. 231 spent several months in working between Swindon and Andover. On the present occasion goods engines had also to be borrowed.

There were in October, 1892, four through passenger trains and one through

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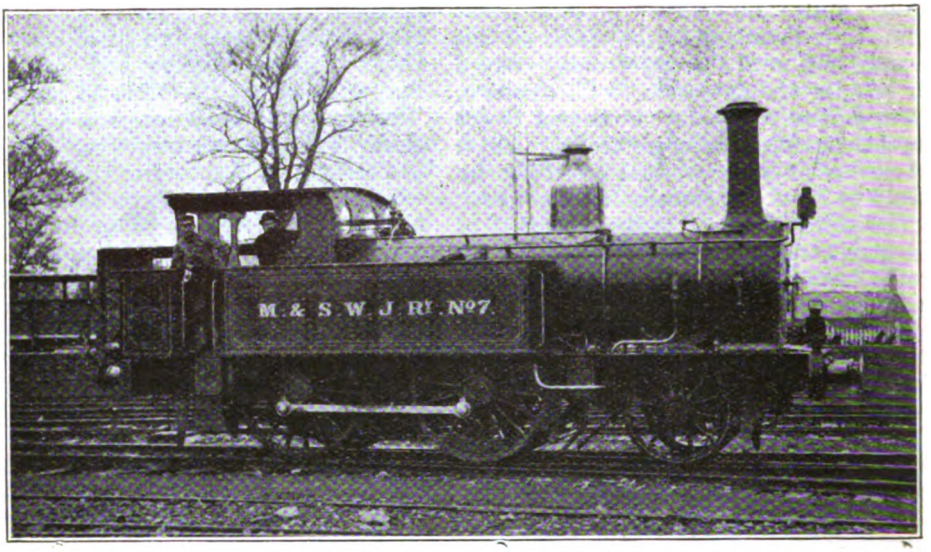


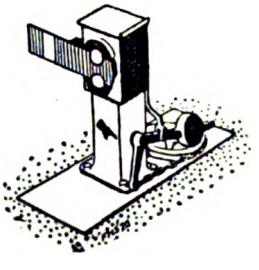
Photo. by] **2-4-0 TANK ENGINE No. 7.** *[R. E. Bleasdale, Warwick.*

Built by Beyer, Peacock & Co.. 1882. Coupled wheels, 5 ft. 6 in. diam. Cylinders, 16 in. by 24 in.

goods from Cheltenham to Andover, one additional passenger train from Swindon to Andover, and a "Saturday's only" passenger from Cheltenham to Swindon, with corresponding trains in the opposite direction.

There were some curious anomalies in the working time-table. Two of the through passenger trains from Cheltenham got through to Andover in 2 hr. 41 min.. and 2 hr. 50 min. respectively, but the last through train which left Cheltenham at 5.10 p.m. apparently behaved like the gentleman who "went to see a man about a dog," and did not turn up at Andover until 9 p.m. As this was usually 9.10 or later in actual practice, four hours may be said to have been the average time for the 68¾-mile journey. But the train which departed from Cheltenham at 7.40 a.m. labelled "mixed" beat the passenger train just mentioned to Andover by an hour. The reason for this spurt on the part of the "mixed" train was revealed in a note in the working time-table, which stated that "this train is to bring on Burton beer." Evidently the Midland and South Western Junction Railway had a due appreciation of the merits of beer and its value to the thirsty natives who lived within the orbit of that railway. Moreover, the working time-table spelled the beer with a capital "B," so that it must have been of special quality.

(To be continued.)



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American Railway Tickets.

By NORMAN THOMPSON.

OWING to the conditions that influence railway operation in America, the design and handling of tickets has developed along somewhat more complex lines than in the British Isles. The chief of such factors to be considered are the universal practice of collection on trains, issuing on trains in many cases, extra precautions against misuse due to the longer time-limit of availability, and the need for a simplified system of adjusting proportions amongst several "roads" participating in a through booking.

Immediately on leaving a station, the conductor passes through the cars and "lifts" the tickets of all who have joined the train at that point and are not proceeding beyond the end of his division (except that special arrangements are made to avoid disturbance of passengers in sleeping cars), so that it becomes necessary to issue some kind of identification check as an aid to the conductor in determining whether a seat is being held for a further distance than paid for.

Such checks usually take the form of thin slips of cardboard, devoid of printing, and differentiated from one another only by punch marks whose meanings are secret and constantly changed. These slips are placed in the hat, or upon some portion of a passenger's clothing, unless special receptacles are fitted along the sides of the cars to hold them; and they are carefully collected before the destination station is reached, or, in the case of a long journey, before the crew is changed at a divisional point. The new conductor then examines tickets (which are left with the passenger till handled by the final conductor) and issues a new check for the length of his run, and so on.

IDENTIFICATION CHECK, PACIFIC ELECTRIC RAILWAY.

The black mark indicates punch perforation.

In "sleepers" and other special equipment the official in charge of each car takes up all the tickets before nightfall, and gives a receipt for each. In this way the successive conductors as they come on duty at different points are enabled to check up the tickets, which, if necessary, are returned in the morning to the holders.

At many stations there is no agent, so that it becomes requisite for the conductor to carry a supply of train tickets, or some form of cash receipt for issuing to passengers who entrain at such places. Advantage of this is often taken to neglect the procuring of tickets at stations where an office is provided, and to discourage this practice, an additional charge of ten cents or ten per cent. of the regular fare is usually made. When there is no alternative, the extra amount will be refunded on application at any ticket office of the railway concerned within a specified time limit. Conductors issue tickets only up to the final point on their individual runs, and, if continuing further, a separate ticket must be obtained.

In the case of "Interline" tickets, it is customary to adopt the "Strip" form, having a "Contract" at the top, in which the conditions under which the passenger is to be carried are set forth, and which is signed by the purchaser in the presence of the ticket seller. Then follow detachable coupons, as many as may be required, according to the number of lines involved all of which bear the same number as the contract and are dated on the back with the name of the issuing office. Some forms are provided with spaces for punching the passenger's personal description for identification purposes. Height (tall, medium, short); colouring (light, dark); age, &c. In punching these particulars

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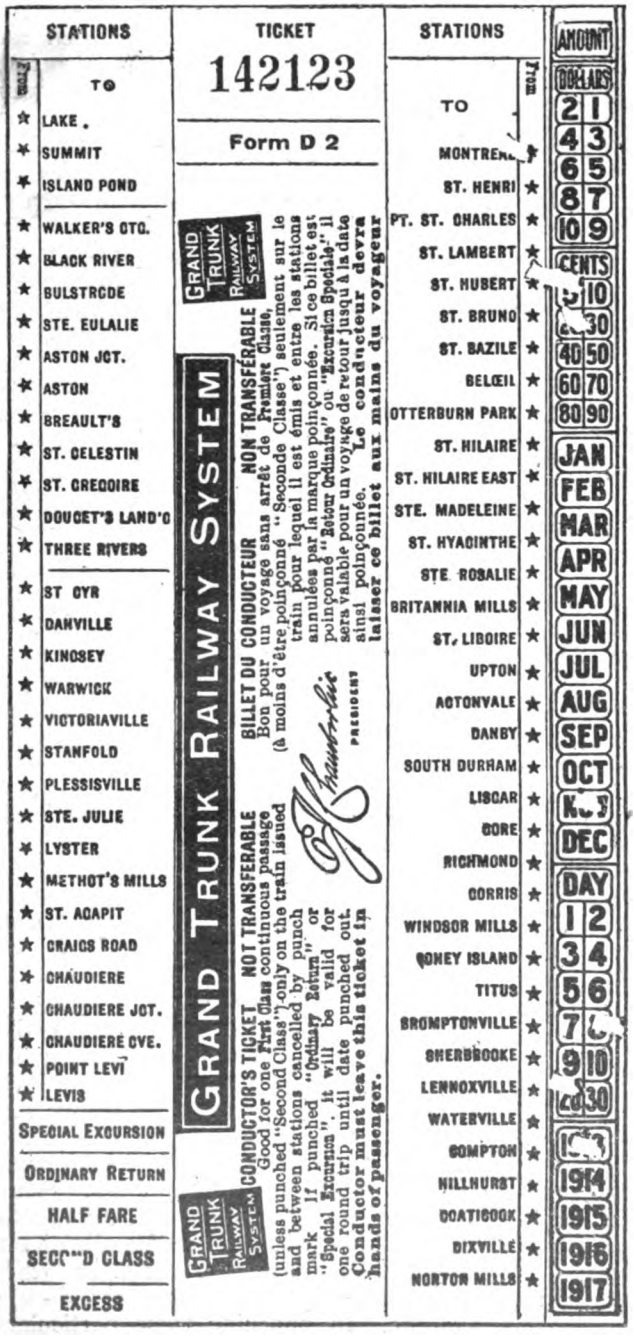
the ticket clerk requires to exercise some degree of tact, especially when his customer is a lady!

It will be realised that the issuing of a ticket for a through journey over a number of different lines is a complicated and lengthy process, which is usually performed some time prior to the date of the contemplated trip at the "down-town" or "city" office, so avoiding congestion and delay at the station office.

Local tickets are often of the familiar card type, but printed on rather flimsy material, and sometimes having an unduly shortened appearance due to a portion being clipped off by the ticket agent for accounting purposes.



SPECIMEN TRAIN TICKET, GRAND TRUNK RAILWAY OF CANADA.
The white spaces over figures, etc., indicate punchings on original.

The various forms of tickets in general use may be classified as follows:—

1. Local. Card. (Issuing line only.)
2. Train or Conductor's. Paper.
3. Interline (through). Coupon.
4. Commutation (season). In book form with detachable coupons.
5. Commutation (season). In strip form with detachable coupons.
6. Cash fare receipts.

Mileage tickets are also procurable, available in any direction at any time within the prescribed limit, the correct amount of mileage being detached by the various conductors on each occasion of presentation. The undue extension of such privileges is, however, regarded as undesirable, as placing too great a section of the population on a special basis, to the detriment of the revenue from the sale of ordinary tickets.

I.—Card Tickets.

These are usually about 2½ in. in length by 1¼ in. wide, the shortened form being 1⅞ in. Frequently a pattern is stamped as

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a groundwork, instead of the surface being plain. The language employed is worthy of note. A "Continuous Passage," for instance, does not have reference to a corridor coach, but indicates a journey completed without "stop-over" at an intermediate point. Instead of "available," the word "good" is used. In a few cases a card ticket is available for one trip in either direction between the stations shown; thus, "Good for one trip in either direction between——and——on date of issue only." The time limit within which a local ticket may be used seems to err on the side of liberality in the following instance: "not good unless dated on back and used within *six* months from date of sale."

A reference to the conditions in the "Tariff" governing the sale of the ticket, and regulations as to "baggage," are other matters that find mention on some card tickets, and one specimen that came under notice of the writer bore the curious legend, "Registered for amount paid." Non-transferability is also a frequent condition.

II.—Train Tickets.

There is a range in size of from 5½ in. to 8½ in. long by 2½ in. to 3¾ in. wide in specimens of which the writer has personal knowledge; they are carried in a book, and punched before the passenger's portion is detached. The information shown includes (not always on the same ticket): Date of issue; date of final limit; class; fare; stations to and from; whether special excursion, ordinary return, half fare, excess, direction, round trip, one way, excursion return; division, &c.

III.—Interline Tickets.

The length of these is sometimes prodigious. The first specimen of the kind the writer met with covered a ride on the Niagara Belt Line, and the attempt to digest the elaborate conditions in the "Contract" is still vividly remembered. The conductor seemed to take a peculiar delight in appearing at the most inopportune moments, just as some view-point of more than ordinary interest was reached. The yard length of obstreperous pasteboard would be caught in the breeze and become entwined about one's person, and by the time the unwieldy ticket, resentful possibly at the ruthless severing of a coupon, had been safely corralled, the scene had vanished beyond recall. Of course, the passage of time exercised an increasingly mitigating effect, until at length only the "Contract" to be "lifted" with last coupon remained, destined however, to grace one's private collection instead!

IV.—Commutation Tickets. Book Form.

About 2 in. by 4 in., or 4½ in., is a common size for these, that is, the covers. A separate coupon (about 2 in. by 1 in.) is provided for each "ride," to be detached by the conductor, the purchaser's signature appearing on the inside of the cover, the contract also being printed thereon. Frequent denominations are "Ten Ride" and "55 Ride" tickets. An example of the latter reads: "Audit check will be collected for first ride and the cover with last coupon." "Good when officially stamped and dated for the transportation of the person only whose name is shown on inside of front cover, and whose signature appears under conditions printed on inside of back cover, on or before date of expiry punched or cancelled." The coupons bear the notation, "This coupon is not good if detached from ticket of same number bearing date and signature."

V.—Commutation Tickets. Strip Form.

The separate coupons are detached from the bottom upwards, until the contract portion is reached, which is good for the last ride. In one design each coupon is dated for a specific day, and any not used on their respective dates are removed by the conductor on the next presentation of the ticket.

VI.—Cash Fare Receipts.

There are many widely differing forms of these; a particularly awkward arrangement is that according to which "projections" are left at the side, to indicate the amount of fare paid.

Devices for achieving the maximum degree of convenience and accuracy in punching have received considerable attention, and many different designs have been evolved for printing the fare and stations

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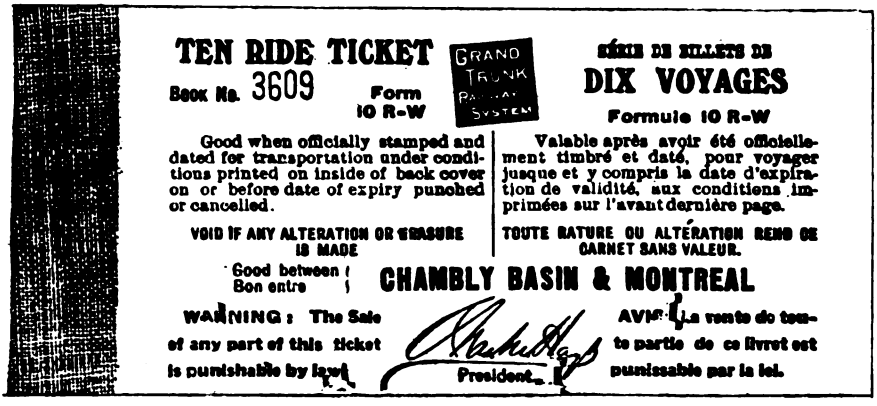
TEN RIDE TICKET
Book No. 3609
Form
10 R-W
GRAND TRUNK RAILWAY SYSTEM
SÉRIE DE BILLETS DE
DIX VOYAGES
Formule 10 R-W
Good when officially stamped and dated for transportation under conditions printed on inside of back cover on or before date of expiry punched or cancelled.
Valable après avoir été officiellement timbré et daté, pour voyager jusque et y compris la date d'expiration de validité, aux conditions imprimées sur l'avant dernière page.
VOID IF ANY ALTERATION OR ERASURE IS MADE
TOUTE RATURE OU ALTÉRATION REND CE CARNET SANS VALEUR.
Good between
Bon entre
CHAMBLY BASIN & MONTREAL
WARNING: The Sale of any part of this ticket is punishable by law.
President
AVIS: La vente de toute partie de ce livret est punissable par la loi.

COMMUTATION TICKET COVER, GRAND TRUNK RAILWAY.

and the date. For denoting the fare paid, the minimum and maximum figures provided, as well as the increments by which they increase, vary very greatly. Sometimes complete sequences are given, but it is the more usual practice to make up compound notations by double-punching, through which plan the amount of printing can be considerably reduced. As many as six years are sometimes printed which ought to be about enough, one would imagine!

An economical method of arranging the stations is to print them once only in a vertical column, with a black line ruled vertically downward through the centre; punched on one side of this line the initial station is indicated; on the other side, the destination. Quite often a row of stars is provided alongside the stations, one star opposite each name, so that two punch marks may be made. The amount of fare paid is sometimes indicated by four separate punchings, denoting respectively, tens of dollars, dollars, dimes, and cents, ciphers being punched where necessary.

The Pacific Electric Railway employs a complex paper ticket, which is given in exchange for either a ticket, cash coupon, trip pass or cash fare. It measures 7½ in. by 2½ in., the printing being blue on a white ground, and the substance thin paper. The stations are printed once only, but with provision for punching three times to indicate "To," "Transfer Point" and "From." This production is entitled "Triplex Ticket and Exchange Check." An "Identification Check" is also in use on the same line, size 3½ in. by 1 in.; it is marked "Not good for passage," "Conductor will punch this identification check to destination of passenger's transportation," "Passenger is to surrender same to conductor on request." "White" is largely adopted for most kinds of tickets, although many colour combinations are also to be encountered, both in regard to ground and the printing imposed thereon.

A curious feature to British ideas is the provision for the redemption of unused tickets, or a rebate on train tickets when presented within a specified time-limit. A recent development is the addition of a "Passenger's Portion" on some ordinary card tickets, which is left in the hands of the passenger permanently; no doubt the idea is to ensure that the purchaser is enabled to prove claim to the accommodation paid for.

In addition to the specification of the stations to and from, one design of coupon ticket bears several different mileages, and the note, "Conductors will not honour this ticket in either direction for a greater distance than the highest mileage shown hereon." It is usual for the signature in facsimile of the President or some official of the traffic department to appear on each ticket.

In conclusion, mention may be made of a freak ticket that was distributed to visitors at the Panama-Pacific International Exposition in San Francisco. The heading read:—

"Western Pacific-Denver & Rio Grande, Missouri Pacific, St. Louis, Iron Mountain & Southern. Around-The-Globe ticket good for

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one first class passage from the Fair at the Golden Gate, Through the Sierras, Across the Great Salt Lake, Over the Rockies to the 'Father of Waters' and the 'Hot Springs State.' Stop-overs allowed at the pleasure of the holder. This ticket is issued to travellers within 'The Globe' in the Palace of Transportation at the Panama-Pacific International Exposition, San Francisco, 1915.

"Good subject to the following contract between the Traveller and the railroads embracing 'The Scenic Line of the World.'

"1st. In accepting this ticket the Traveller agrees to carry only such baggage as will not distract attention from the **comfort, service** and **scenery** of the trip.

"2nd. Information, inspiration and admiration will not be construed as excess baggage. This will also apply to such corroborative literature as the Traveller may acquire within the Globe.

"3rd. The acceptance of this ticket does not require the Traveller to complete the tour within the Globe by the most direct route. Diverse routes and doubling back will be permitted.

"6th. In consideration of seeing America's grandest mountain scenery and her noblest Western possessions, reproduced in replica within the Globe, the Traveller agrees to lend his imagination to a realisation of the scenes depicted.

"8th. A determination by the Traveller to see and learn more of the beauty, grandeur, resources and opportunities along the route of the 'Scenic Line of the World' shall be considered payment in full for this ticket.

"I, the Globe Traveller, hereby accept and agree to be governed by such conditions as appeal to me in the above contract."

The size of this interesting advertising device was 22 in. by 3 in.; black printing on a green ground, with a red back on which a map and several miniature pictures were impressed.

CALCUTTA-BOMBAY MAIL TRAIN.

Photo.] **BENGAL-NAGPUR RAILWAY 4-6-0 LOCOMOTIVE.** [*E. S. Barnard.*

This train, provided jointly by the Bengal-Nagpur and Great Indian Peninsula Railways, is shown passing the Vivsee Minor Channel of Rantak Reservoir, between the stations of Khal and Tharsa, 677 miles from Calcutta,

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Round-About Railway Routes.

By G. A. SEKON.

BUSINESS men and financiers of to-day pride themselves on their boldness and imagination. Their predecessors of 70 to 80 years ago certainly possessed these useful business traits in no small degree! This will be realised when we consider that in many cases they were willing to sink large sums of money in constructing railways by extremely circuitous routes in order to serve various places of importance, well knowing that in a few years such places would be served by a direct line, with the result that the capital sunk in the first railway would become relatively unproductive. Indeed, the desire of every place to be connected with the railway was so keen that even when the distance to London or other business centres was much more by the railway than by the coach road, the saving in time gave the circuitous railway an immense advantage over the coach.

Another point that evidences the prescience of early railway projectors was the construction of direct railways radiating from London to the principal towns in each quarter of the compass. The London and Birmingham, London and Bristol, London and Southampton, London and Brighton, Northern and Eastern (London towards Cambridge), and Eastern Counties (London to Colchester) were early lines so constructed. In one case only—that of Dover, the gateway to the Continent—did Parliament object to a direct line. The promoters of the Dover railway were compelled to utilise the Brighton line to Redhill. Redstone Hill, as it was then called, is about the same distance south of London as Dover; consequently the Dover Railway ran practically due east from Redhill to its coastal terminus. The gradients of this east to west line were extremely good, and with the locomotive power then available it is possible that the time by the circuitous Redstone Hill route was no longer than would have been occupied by a journey over the hard gradients of a direct line, which the configuration of the intervening country would have caused to be of a very undulating character.

Some of the early circuitous routes to important towns were by branches off the already circuitous Dover Railway—as the South Eastern Railway was frequently called in its early days. The county town of Kent was served by a single line branch from Paddock Wood*, 10 miles in length, opened on September 24, 1844, only 13 months after the railway to Paddock Wood was opened, and in the same year that the main line was opened to Dover. The construction of the branch occupied only ten months. The opening of this branch so soon after the main railway was completed to the junction station shows that the directors of the S.E.R. were early alive to the advantages of tapping neighbouring sources of traffic and did not demur to risking capital in such an enterprise.

The distance between London Bridge and Maidstone by this route was 56 miles, compared with 32 miles "as the crow flies." Through trains were run between London and Maidstone, as well as local trains between the latter place and Paddock Wood, connecting there with the up and down Dover trains. The electric telegraph was installed from the first on the Maidstone branch and continued along the main line to Tonbridge. This accounts for the telegraph department of the old S.E.R. being located at Tonbridge, and remaining there under the S.E. & C.R. and Southern Railway to the present time. The telegraph proved to be so great a help in working the Maidstone line that the S.E.R. decided to use it on other parts of the railway. The traffic increased so considerably that the branch was doubled in the spring of 1846.

The North Kent section of the S.E.R. was extended from Strood to Maidstone in 1856, giving a shorter route to the latter place from London Bridge—41 miles against 56 miles. The Paddock Wood-Maidstone branch then became merely a

* Called Maidstone Road until the opening of the branch to Maidstone.

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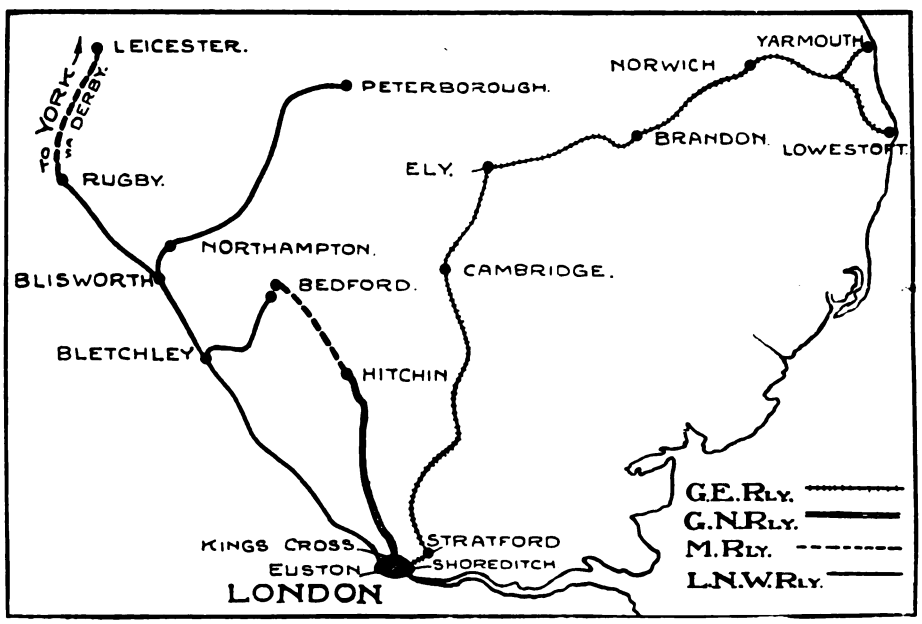
line for local traffic to and from the main London-Dover section, but the opening of the direct line to Tonbridge *via* Sevenoaks in 1868 reduced the distance from London to Maidstone *via* Paddock Wood to 42 miles, so that there is now little difference in the mileage of the two routes, though a change of trains is necessary *via* Paddock Wood. There are, however, at the present time a few "roundabout" trains from London to London in both directions *via* Redhill and Maidstone West, traversing both the circuitous original route and the later North Kent route. The opening of a competitive line to Maidstone East by the construction. It follows the valley of the Stour almost to Ramsgate Town station, which is a terminus, to continue thence to Margate Sands the trains have to reverse. The line crosses the main London-Dover highway on the level in Canterbury, as well as the main road continuation to Ramsgate and Margate at Sturry. At Canterbury West a junction was effected with the Canterbury and Whitstable Railway (opened in 1830). This railway was then worked for the greater part by stationary engines. A peculiarity of the trains on this old line is that they convey only 1st and 3rd class



EARLY ROUNDABOUT RAILWAY ROUTES, NORTH OF LONDON.

L.C. & D.R. in 1874 had little effect on the then existing routes, as the distance from Victoria was 41½ miles against 42½ miles from Charing Cross *via* the North Kent Loop Line.

Other Kentish towns served by branches off the Dover line were Canterbury, Whitstable, Ramsgate and Margate. The distances by railway by the original route, *via* Redhill, was to Canterbury 80¾ miles, Whitstable 86¾ miles, Ramsgate 96¾ miles, and Margate 101 miles, the crow-flight distances being about 54, 50, 65 and 64 miles respectively.

The Ashford-Margate branch was authorised in 1844, and no time was lost in passengers, although on other sections of the old S.E.R. 2nd-class passengers have always been carried. The line from Ashford was opened to Canterbury on February 6, 1846. The branch was at first to have been a single one, but so convinced were the directors of the big traffic it would carry that during construction a second line was laid down, and it was opened as a double line of railway. The opening to Ramsgate took place on Easter Monday (April 13), 1846, and to Margate on December 1, in the same year. So desirous was the railway to shorten by any means the distance to Margate that a bill was promoted in 1846 to construct a

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branch about seven miles long to avoid Ramsgate. This line would have saved about four miles, and followed the course of the Canterbury-Margate highway from where the Margate and Ramsgate roads bifurcate. The bill did not succeed in obtaining Parliamentary sanction.

The opening of the L.C. & D. Railway to Margate and Ramsgate in 1863 reduced the railway distances from London to 74 and 79 miles respectively.

Sandwich and Deal were served by a branch leaving the Ashford-Margate line at Minster (Thanet) opened in 1847. The distance to the coast town being 101 miles; by aeroplane the mileage is but 67.

Hastings first obtained railway communication on June 27, 1846, by means of the London, Brighton and South Coast Railway. The route was to Brighton and thence *via* Falmer and Lewes, the distance from London being 83 miles to a temporary station about the site of the West Marina station at St. Leonards. The connecting line from Keymer (now Wivelsfield) to Lewes was opened in 1847. This reduced the distance by 8½ miles, and after 76 years this line remains the L.B. & S.C. section of the Southern Railway's route to Hastings, whilst the mail train continues to work *via* Brighton to the present day. Although the L.B. & S.C.R. line to Hastings was so circuitous, the S.E.R. was at the time ferverishly hastening the completion of a route considerably longer, *i.e.*, *via* Redhill, Ashford and Rye, a total distance of 93½ miles from London Bridge. This branch from Ashford to Hastings was opened February 13, 1851. Such dilatoriness was displayed in the construction of the Ashford-Hastings line that during the last year the payment of S.E.R. dividends was disallowed by an injunction of the Court of Chancery until the opening of this branch. The Hastings station was at the same site as at present, but the line was continued through St. Leonards by the S.E.R. and formed an end-on junction with the L.B. & S.C. Railway at Bo Peep, enabling the L.B. & S.C.R. trains to work through to Hastings. A dispute between the S.E. and L.B. & S.C. Railways as to the terms upon which the latter should use the Hastings station, resulted in the S.E.R. removing the junction between the lines at Bo-Beep, thus restricting the L.B. & S.C. to its own metals until a settlement was arrived at.

The Bo-Peep tunnel, although of adequate dimensions for the rolling-stock then in use, in later years prevented coaches of the extreme dimensions being worked through it. This restriction was inconvenient, especially with regard to "foreign" vehicles. To rebuild the tunnel to a wider loading gauge was out of the question, but a few years ago the difficulty was got over in an ingenious manner. The roads through the tunnel were shifted nearer each other, thus reducing the 6-ft. way. This arrangement allows vehicles that will pass over other sections of the railway to be worked through the tunnel, but no up train may be in the section, whilst a down train occupies it and *vice versa*.

Whilst the S.E.R. was constructing its Ashford-Hastings line, it obtained powers to extend its system from Tunbridge Wells to Hastings. This line was opened to Bo Peep Junction (St. Leonards) on February 1, 1852, the distance from London to Hastings being 74 miles, or two miles longer than the L.B. & S.C. Railway's route. The two companies agreed to divide equally the receipts from the London-Hastings traffic. The opening of the direct Tonbridge line *via* Sevenoaks in 1868 reduced the distance by the S.E.R. route from London Bridge to 60½ miles and consequently gave this route a considerable advantage over that of the L.B. & S.C.R.

Portsmouth, which for many years past has enjoyed direct communication with London by the late L. & S.W.R. route *via* Haslemere, and a comparatively direct route by the late L.B. & S.C. Railway through Horsham, at first was served by extremely circuitous routes. The original railway communication was provided by the London and Southampton Railway (afterwards renamed L. & S.W.R.). The route was from Nine Elms to Bishopstoke (now Eastleigh) and thence by a branch line to the Portsmouth station on the west side of the harbour, now known as Gosport station, the distance being 88 miles. This route was opened in November, 1841, but a portion of the Fareham tunnel collapsing shortly after, the line was closed, and reopened February 7, 1842.

By means of its western coast line the

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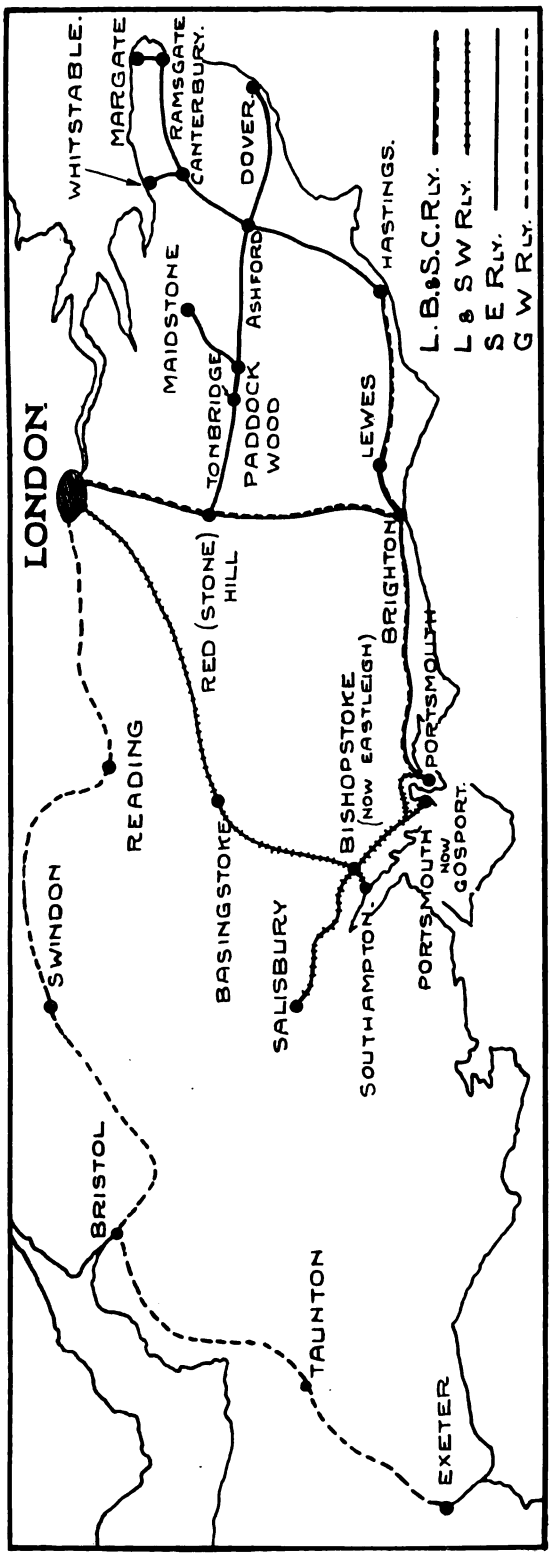

EARLY ROUNDABOUT RAILWAY ROUTES, SOUTH AND WEST OF LONDON.

L.B. & S.C.R. approached Portsmouth from Brighton, and reached the former town on June 14, 1847, the distance from London Bridge being 95½ miles. The L. & S.W.R. entered Portsmouth *via* Cosham at the end of 1848, the journey from Waterloo being exactly the same length as from London Bridge. This circumstance had weight with the L.B. & S.C.R. in their decision to sell the L. & S.W.R. half share in the line from Cosham to Portsmouth for £60,000, instead of compelling the latter company to construct an independent line over the last 4½ miles into Portsmouth. This route of the L. & S.W.R. to Portsmouth was 5½ miles longer than to the original Portsmouth station at Gosport, but the new station being in the town, instead of on the other side of the harbour, was much more convenient to passengers. Queen Victoria, in her many journeys to and from the Isle of Wight, always travelled *via* Gosport, private accommodation being provided for the Royal specials there. For many years there was also a private station for these Royal specials in London near the Nine Elms Loco. Depôt, so that Queen Victoria in her journeys between London and Osborne did not make use of public railway stations.

A "rift in the lute" of the London-Portsmouth traffic arrangements developed in 1858. An independent company had constructed the direct line *via* Haslemere to Havant, and, after negotiations, the L. & S.W.R. agreed to lease the new line. The L.B. & S.C.R. strongly objected to this arrangement, as the direct line being 21½ miles shorter than the then existing routes would obviously carry the London traffic. Except as lessees of the direct Portsmouth Railway the L. & S.W.R. had no rights over the L.B. & S.C.R. between Havant and Cosham, and the L.B. & S.C.R. determined to prevent

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the L. & S.W.R. trains from off the direct line using this portion of the L.B. & S.C.R. The direct line was to have been opened on January 1, 1859. A few days before, the L. & S.W.R. essayed to run trial trains, but the L.B. & S.C.R. had taken up the junction rails at Havant and had there a body of men who endeavoured, but unsuccessfully, to prevent the L. & S.W.R. from laying in a fresh junction. The South Western officials thought it would prove all plain steaming onward to Portsmouth, but were disappointed, the London and Brighton Company having also removed the rails at a point some distance beyond Havant, with the result that the L. & S.W.R. train could not get through. Legal proceedings followed, but on January 24, 1859, the L. & S.W.R. commenced a passenger service over the direct line. A competition in fares ensued, each company losing £80,000 as a result—the return fare to London was 3*s.* 6*d.*, the tickets being available for two days. It was not till May, 1867, that by joining various branches (the last being from Horsham to Dorking) that the late London, Brighton and South Coast Railway was able to open its present Mid-Sussex route to Portsmouth; this, however, is 12 miles longer than the late London and South Western Railway direct route, but ere this the original pooling arrangement (two-thirds to London and South Western Railway and one-third to London Brighton and South Coast Railway) for the London-Portsmouth traffic had been reverted to.

Bedford is an important town which for several years had been content with circuitous railway communication with the Metropolis. The first trains to reach Bedford travelled 63 miles, the route being from Euston to Bletchley on the main line of the old London and North Western Railway and thence by branch, which was opened on November 16, 1846. The line was laid double throughout, and a branch platform was provided at Bletchley. The opening train consisted of 33 carriages drawn by two locomotives. The next railway communication Bedford had with London was provided by the Midland Railway by its extension from Bedford to Hitchin, and thence over the Great Northern Railway to King's Cross; this route was opened May 8, 1858, the distance being 48¼ miles, thus providing a shorter railway route between London and Bedford by 1½ miles than the later all-Midland route *via* Luton. The extension of the late Midland Railway to London was decided upon because the old Great Northern Railway was unable, or unwilling, to provide adequate facilities between Hitchin and King's Cross for the increasing Midland Railway traffic, which was largely competitive with its own traffic. The Midland Bedford-London line was opened to Moorgate Street July 13, 1868, and to St. Pancras on October 1 in the same year. The Midland Railway through trains were withdrawn from the Hitchin-King's Cross route, and the Bedford-Hitchin line became merely a cross-country branch. So little traffic was worked over it that, about eight years ago, one set of rails were removed, and it is now single line.

Peterborough was provided with railway communication with London in 1845 by a route 110¼ miles in length, whereas the distance by the Great Northern section of the London and North Eastern is but 76¼ miles.

The London and Birmingham Railway had not long been opened before Northampton, which had successfully defeated the attempt to make the main line through the town, repented and wanted a railway. Consequently, the London and Birmingham Railway proposed a line 47½ miles in length from Blisworth through Northampton to the Eastern Counties, Peterborough being chosen as the terminus. Strenuous opposition was offered to the scheme in Parliament, and it obtained sanction merely by a majority of one vote. Construction was commenced in March, 1844. The line was double from Blisworth to Northampton and single thence to Peterborough. It was built almost on the surface of the land, but slight embankments were provided at places where floods were likely. This length of railway was notorious for the number of public roads crossed on the level—21 in all. Speed of trains has to be reduced to four miles an hour over the level crossings. The speedy construction of this line—it was opened for traffic June 2, 1845, 47½ miles in 15 months—must have constituted something of a record even in those days of expeditious railway building. There was a tunnel about one-third of a mile in length near

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Peterborough. The line cost £430,000 to construct, the electric telegraph was installed from the commencement. As soon as the line was opened there was talk of the Northern and Eastern Railway extending to Peterborough by a much shorter route, which would naturally abstract all the London traffic from the line, yet the London and Birmingham Railway decided to double the branch between Northampton and Peterborough, the work being put in hand in 1846. It appears strange that although there was much talk of a London to York Railway at this time, which would obviously pass through Peterborough, no reference to such opposition appears to have been made. Probably the Northern and Eastern Railway was expected to be the line that would be continued to York. In June, 1846, the Great Northern Railway was sanctioned, and on August 7, 1850, was opened, from a temporary station at Maiden Lane, King's Cross (on the site of the present King's Cross Goods Depôt) to Peterborough, a distance of 76 miles. The quickest Great Northern Railway train occupied 3 hours and the fastest by the L. & N.W.R. 4 hrs. 10 min. The first class fare was reduced by 5*s.* 7*d.*, the second class by 4*s.* 3*d.*, and the third class by 2*s.* 2*d.*, in consequence of the less distance by the Great Northern route.

The opening of the Great Northern Railway from London to Peterborough enabled it to run trains to York *via* its circuitous Lincolnshire Loop Line. But by this route the distance was only 210 miles compared with 219½ miles by the previous composite route over the London and North Western Railway, Euston to Rugby, thence by the two Midland Railways to Normanton, and on to York by the York and North Midland Railway. This route had been in existence since July 1, 1840, the time on journey in 1850 being 8 hr. 55 min., against 6 hr. 45 min. by the Great Northern Railway Loop Line. On August 1, 1852, the Great Northern Railway direct route through Grantham and Retford was opened, reducing the distance to York to 190½ and the time to five hours. This was the death blow to the 219½ miles route from Euston to York, on which the trains had been accelerated in 1850 to occupy only 6½ hours.

The first railway route between London and Salisbury was *via* Bishopstoke (now Eastleigh), the distance to the original Salisbury terminus being 93¾ miles from Nine Elms (95¾ miles from Waterloo). The branch, 22 miles long from Bishopstoke, was opened on January 27, 1844. This continued to be the only railway between London and Salisbury till June 30, 1856, when the Great Western Railway opened a more circuitous route; the distance *via* Chippenham being 134¼ miles, whilst later, by the Berks and Hants line, the mileage was 125½ miles. It was not until May 1, 1857, that the London and South Western Railway direct route *via* Andover Junction was opened, reducing the distance from Waterloo to 83¾ miles, as compared with the 95¾ miles to the same Salisbury station *via* Bishopstoke. This was the Milford station, the extension to Fisherton station not being completed till later. The continuation of the railway from Salisbury through Yeovil to Exeter, opened July 19, 1860, not only gave the London and South Western Railway a route to the "Faithful City" but provided London travellers with a means of reaching Exeter 22¼ miles less than by the circuitous broad-gauge route *via* Bristol; the distances being from Waterloo 171¾ miles and from Paddington 194 miles. The London and South Western Railway retained this considerable advantage in respect of mileage until July 1, 1906, when, by means of the "cut-offs" at Lavington and Somerton, the Great Western Railway line through Hungerford became the direct route to Taunton and beyond. The distance, Paddington to Exeter, was thus reduced to 173¾ miles, so that although the route of the Southern Railway to Exeter is still the shorter by two miles, the difference in mileage is so slight as to place the two routes on an equality.

Lowestoft and Yarmouth are towns which early railway enterprise provided with circuitous communication with London. A glance at a map will show that a railway from London to these East Coast resorts should pass through Colchester and Ipswich. Such was the intention of the Eastern Counties Railway when incorporated in 1836. After many financial difficulties this line reached Colchester, 51 miles from Shoreditch terminus, in 1843, but money could not be obtained

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to continue construction eastward. Meanwhile the Northern and Eastern Railway had built a line from Stratford to Newport, and the Eastern Counties Railway had continued it through Cambridge and Ely to Brandon; here an end-on junction was formed with the Norfolk Railway, which was composed of the Norwich and Brandon and the Norwich and Yarmouth; the latter had been opened on May 1, 1844, and on July 30, 1845, the Eastern Counties Railway was opened to Brandon and the Norfolk from Brandon to Norwich, so from that date it was possible to travel by train from London to Norwich and Yarmouth.* The distances from Shoreditch, *via* Stratford and Ely, were: Norwich 125¾ miles, and Yarmouth (Vauxhall *via* Trowse) 144 miles. The Norwich and Yarmouth Railway, a single line, gained fame from the first because the block telegraph was employed from its opening, and it was claimed that an engine ran a mile in 44 seconds = 81 9/11ths miles an hour. The line to Lowestoft *via* Reedham was opened July 1, 1847, the distance from Shoreditch *via* Stratford, Ely and Norwich being 149¼ miles. In the 'forties and 'fifties steps were taken to complete the direct routes to Norwich, Yarmouth and Lowestoft by extensions eastward from Colchester. Several independent companies were formed, which in time coalesced and became the Eastern Union and the East Suffolk, and eventually were amalgamated with the Great Eastern Railway. Norwich (Victoria) was reached by this route December 12, 1849, the distance from Shoreditch being 112 miles, a line connecting with the Norfolk Railway at Trowse was opened in 1852, giving Yarmouth (Vauxhall) and Lowestoft a route about 12 miles shorter than *via* Ely. It was not, however, until June 1, 1859, that the East Suffolk Railway was opened; this provided the present short routes to Yarmouth (South Town) and Lowestoft. The distances from Shoreditch being 121 miles to the former and 117 to the latter town.

* The permanent bridge across the Wensum at Trowse was not completed at this date.

AN IRISH RAILWAY SCENE.

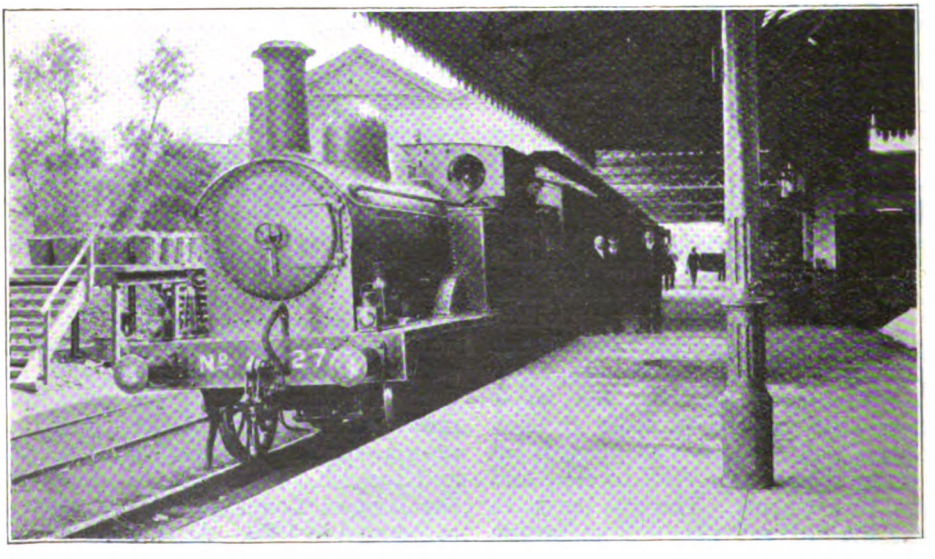

Photo.] [*G. Wallis Palmer.*

2-4-2 TANK ENGINE NO. 27, ON TRAIN RUNNING BETWEEN DOWNPATRICK AND DOWNPATRICK LOOP LINE JUNCTION, BELFAST AND COUNTY DOWN RAILWAY.

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The Turbo-Electric Locomotive at Work.

RAMSAY LOCOMOTIVE ENTERING BOLTON STATION WITH PASSENGER TRAIN.

IN the RAILWAY MAGAZINE for May, 1922, we gave some particulars of the then recently constructed Ramsay turbine locomotive. This machine has been under trial for about 18 months, and we are now in a position to describe in detail its chief features, and arrangement of machinery.

The turbo-electric locomotive has been designed with the idea of providing electric traction without the drawbacks and expense of stationary generating stations and of equipping the line for working electric trains. In other words the electric generating station is carried on the engine, and the steam produced by the combustion of coal in the locomotive boiler, instead of being employed to haul the train, is used to generate electric energy, which provides the motive power.

A feature of the Ramsay system is that the feed water can be employed over and over again, very elaborate apparatus being provided for condensing the steam ; hence having obtained a good supply of water, there is no opportunity of introducing deleterious feed water, which, as is well known, has extremely destructive action upon the costly locomotive boiler. The inclusion of electric motors upon what, for the sake of clearness, may be called the tender portion of the combination, adds sufficient weight to the condenser vehicle to obtain ample adhesion, so that a further advantage is that the total tractive effort of the turbo-electric locomotive is equal to that of two 6-coupled engines each having about 65 tons available for adhesion.

On British railways the locomotive water supply, by providing tanks where the water is naturally suitable and elsewhere by treatment is made so, already has been arranged so that the necessity for the continuous use of the same feed water does not arise, whilst conditions where locomotive power such as that available by the employment of the turbo-electric engine are not large in this country. It is therefore in countries with bad water conditions and where loads such as those the Ramsay locomotive is designed to haul, are always available that advantages may be expected to arise from its employment. Many experiments in train hauling with the Ramsay turbo-electric locomotive have been carried out on the late L. & Y. section of the L.M. & S.R. ; the engine was stabled at Horwich, and worked empty passenger trains between its home station and Bolton, and between Horwich and Southport. With a load of 275 tons, on runs to and from Southport, a total distance of 100 miles was run at a speed of 60 miles an hour. On none of the trial runs did the turbo-electric locomotive fail, and therefore there was no need to make use of the pilot engine that accompanied the turbo-electrically hauled train on its trips.

We will now proceed to give some details of the design and machinery of the

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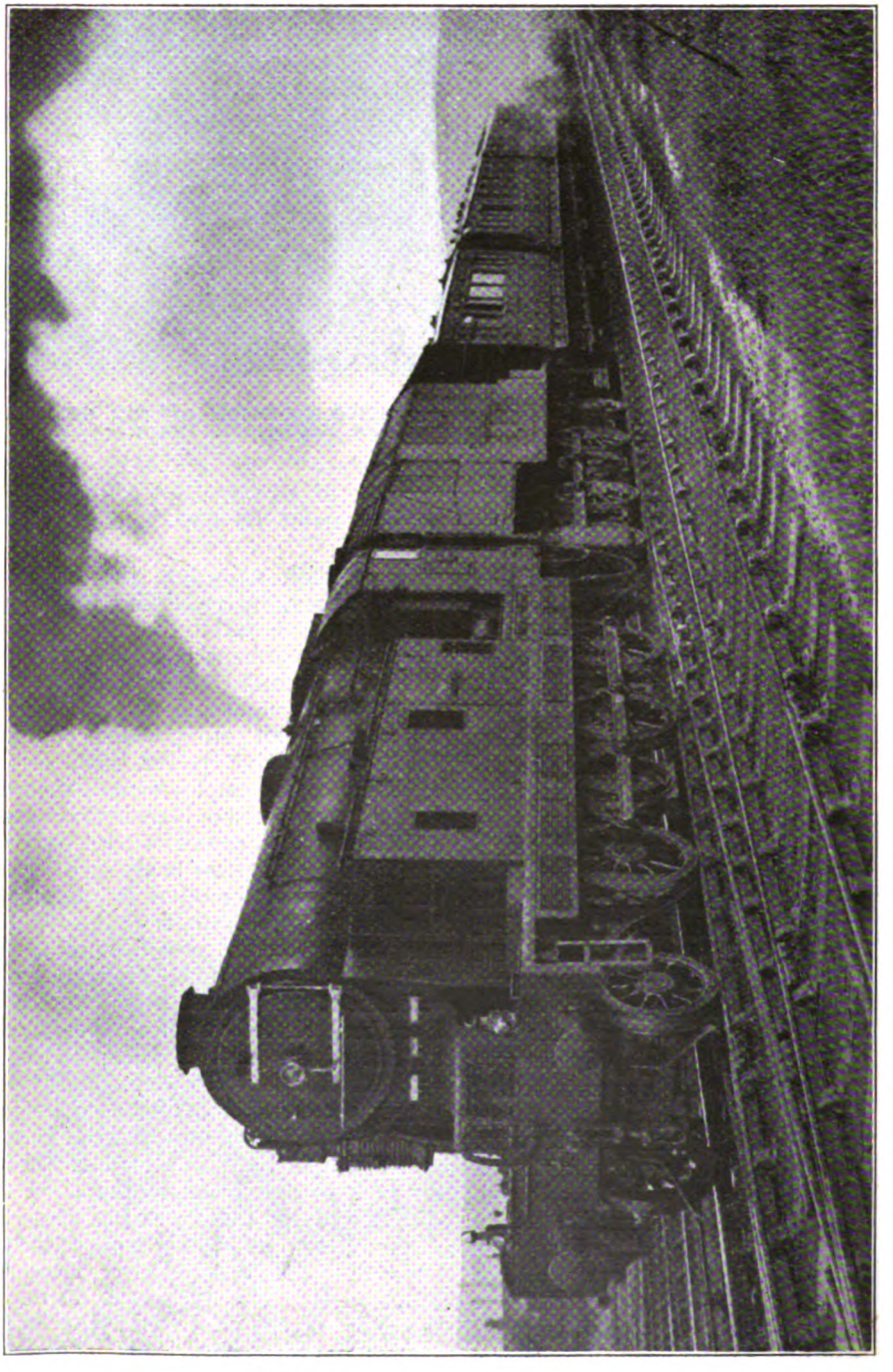

THE RAMSAY LOCOMOTIVE HAULING A TRAIN OF PASSENGER COACHES AT SPEED.

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Ramsay locomotive, which was built at the Scotswood Works of Armstrong, Whitworth & Co., Ltd.

The machine comprises two sections connected by a universal joint. The front section (which in outline partakes largely of the character of a 2-6-0 steam locomotive), contains the boiler, fire-box, turbines, generator and two electric motors. The rear section (which would be the tender of an ordinary locomotive) houses the coal and water supply, the condenser, air fan, and hot well and electric motors for driving the 6-coupled wheels of this section.

The boiler has a heating surface of 1,243 sq. ft., the grate area is 28½ sq. ft., whilst the superheater has a surface of 300 sq. ft., the working pressure is 200 lb. per sq. in.; combustion is accelerated by forced draught, a fan for the purpose being placed in the cab. The boiler is high-pitched, the centre being 10 ft. 3 in. above rail level, to enable the main turbine to be beneath it. Coupled to and in front of the main turbine is the electric generator, slung beneath the frame are two electric motors, engaging with the driving shaft, the fly wheels of which, although coupled to the three pairs of coupled wheels (one in front and two at rear) do not work on the rails, being of smaller diameter than the coupled carrying wheels. At the footplate end of the tender is the coal bunker (4 tons capacity), water tank (2,500 gallons), with the hot well beneath; in the centre is the condenser, with a replica of the electric driving machinery below and between the frames. At the rear is the condenser fan with the air scoop projecting over the rear buffer beam.

The used steam from the turbines reaches the condenser by means of a flexible rubber pipe of large diameter, with aluminium rings to protect and strengthen it.

The main turbine, designed for steam at 200 lb. pressure, superheated to 300°F., is of the impulse type, and of 9 stages, with a mean blade diameter of 36 in. The turbine can rotate at a maximum of 3,600 revolutions a minute.

This turbine drives a three-phase generator designed to develop 890 kw. at 3,600 r.p.m., the pressure being then 600 volts. The single stage auxiliary turbine drives a direct current dynamo, whose functions are to excite the poles of the main generator and provide electrical energy for the motors driving the condenser fan, the condenser rotor and the extraction pump and also the current for lighting the train.

The auxiliary turbo-set runs at 3,600 r.p.m. and is subjected to the same steam conditions as the main turbo-set.

The driving motors are in pairs, each pair—one under the boiler, and the other under the condenser vehicle—is bolted to a centre stretcher carrying a transmitting shaft and spur wheels. Pinions are keyed to the motor shafts, and these gear with the spur wheels, the power being transmitted through coupling rods from the spur wheels to the driving wheels in the ordinary manner.

The type of motor employed is that known as slip ring, alternating current being employed. The normal capacity of the motors is 275 b.h.p. each, with an hour's rating of 85 b.h.p. overload. With the locomotive running at 60 m.p.h. the motors make 1,175 r.p.m. The voltage is 600.

The chief feature of the Ramsay design of turbo-electric locomotive is the condenser, which consists of a ring-shaped nest of tubes built into two headers. The exhaust steam from the turbines enters one header, passes through the tubes, is condensed and the water resulting from the condensation collected in the other header. This water then passes into the hot well from which it is returned to the boiler to be converted into steam again. The accelerated evaporated principle is employed in this condenser

The nest of tubes is in the form of a drum which rotates in bearings, the drum being housed in a tank, the bottom of which contains water. The tubes pass through the water as they rotate. After they leave the water rapid evaporation is produced by passing air at a high velocity over them and the result is equally rapid condensation of the steam inside the tubes. The air is supplied by a specially designed fan. The inlet to the fans is provided with a scoop which forms an easy path for the entering air and so eliminates the losses from the shock which would occur if no such provision were made. The water used in the boiler and that for wetting the tubes are kept separate. The former is used in a closed circuit and is nut

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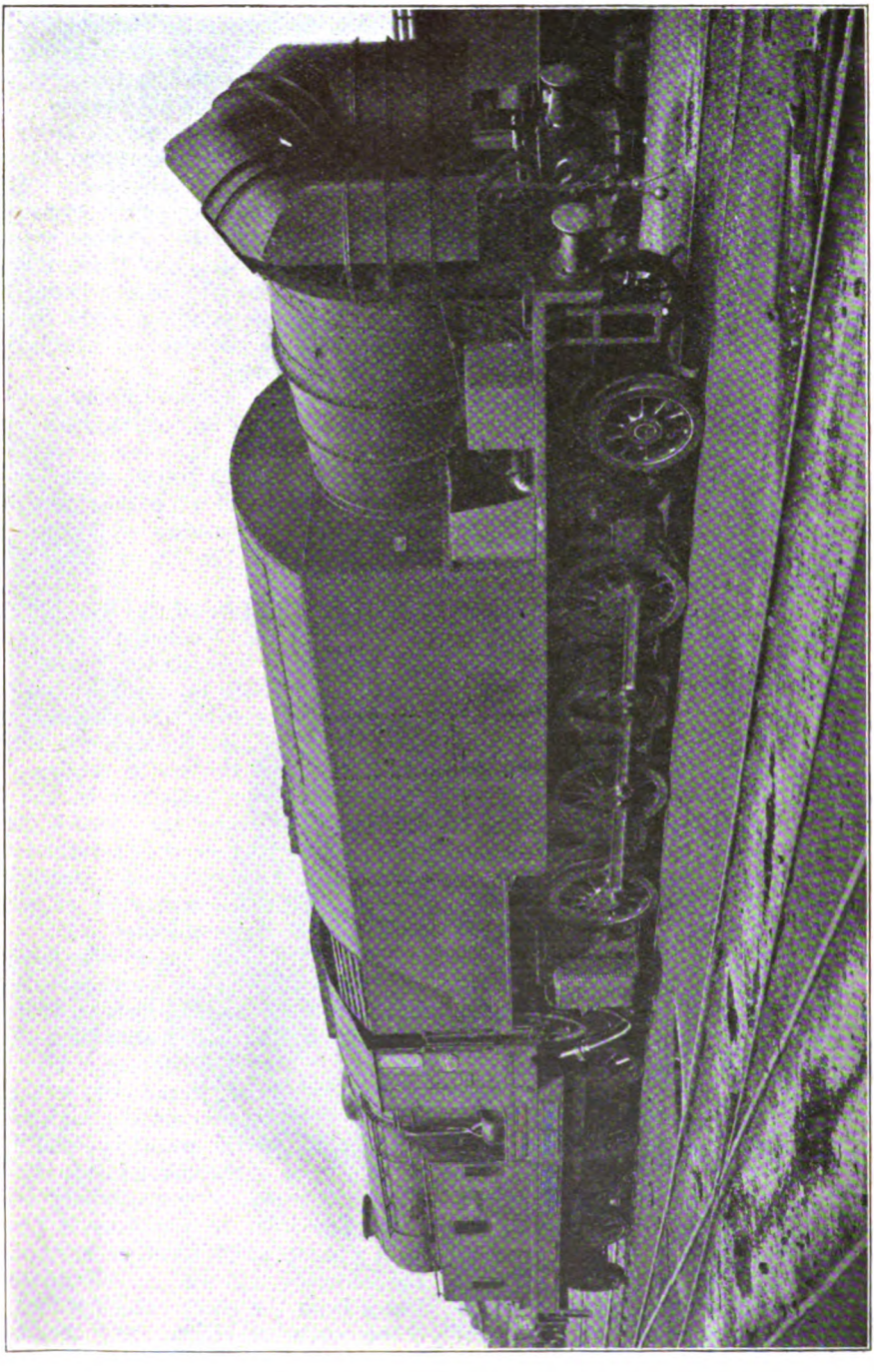

REAR VIEW OF LOCOMOTIVE SHOWING CONDENSER AND AIR SCOOP.

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wasted except for small leakages, hence very little make-up is required. The advantage of this is specially felt where locomotives have to pick up bad water during runs, the use of such water resulting in rapid deterioration of the boiler.

Having described the chief features of the Ramsay locomotive, an account of the method employed in starting the engine is of interest. As the starting torque of the electric motors is about three times that of normal, the manipulation necessary to start the Ramsay locomotive is more complicated than that employed in a steam locomotive. The procedure is as follows :— before starting the locomotive the auxiliary turbine is run up to full speed, thus providing excitation for the main generator and energy for the auxiliaries. The main turbine is then run up to half-speed, viz., 1,800 r.p.m. At this period the motors are connected in series, and the locomotive may be started.

When a turbine speeds up from rest to full speed its torque decreases in the ratio of two to one, and when passing through half speed its torque is 1·5 times the normal and this is the torque of the main turbine when running at 1,800 r.p.m.

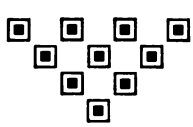
Again, two alternating current motors when connected in cascade (*i.e.*, series) and running at half the speed of the generator have twice the turning moment which they have when connected in parallel with the same power consumption. Therefore with the motors in cascade and the turbine running at half speed the torque from rest to quarter speed will be $2 \times 1 \cdot 5$, or three times the normal torque. The motors are now connected in parallel, the turbine still running at half speed, the speed of the locomotive increases from one-quarter to one-half speed, the torque at the latter speed being 1·5 times the normal. After this the turbine speed is brought up to its maximum and the torque drops from 1·5 times the normal to normal.

The tractive efforts at the rim of the wheels for the acceleration period from starting to 60 miles per hour are :—

M.P.H.	Tractive Effort.
Starting.	22,000 lbs.
15	22,000 lbs.
30	11,050 lbs.
60	8,600 lbs.
—	
Normal running 60 m.p.h.	6,000 lbs.

In controlling the speed of the locomotive from rest to 60 m.p.h. the main and auxiliary turbines having been brought to speed by means of a handwheel in the cab, which regulates the steam inlet, control of the locomotive is carried out electrically by means of the control wheel on the controller fixed in the cab. The control wheel being in the zero position the motors are without current and connected in cascade. To start the locomotive, the control wheel is moved to the first notch, thereby closing the excitation circuit to the turbo-generator and connecting the motors in cascade, with resistance wholly in circuit. Resistance is now cut out by further movement of the control wheel until a first running position of 15 m.p.h. is obtained. If a greater speed is desired the control wheel is further moved to alter the motor connections from cascade to parallel, the excitation circuit again being closed ; notches being provided on the controller, each of which corresponds with a given speed of the locomotive. In this manner the locomotive speed can be increased from 30 to 60 m.p.h. A reduction in the speed of the locomotive is obtained by turning the control wheel quickly back to the zero position. The excitation circuit being thereby opened, the motors are without current and connected in cascade ready for starting again.

As a result of the trials of this engine, designs are being prepared for an improved turbo-electric locomotive, which will embody considerable simplification of many details, a reduction of axle loads and increase in power.



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RAILWAY MAGAZINE readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition (1923) of this standard railway reference work is on sale at 5s. net, or by post from the RAILWAY MAGAZINE Offices, 33, Tothill Street, Westminster, London, S.W.1, 5s. 6d., Overseas, 5s. 8d.

Through L. M. S. Penzance-Aberdeen Service.

Considerable speculation has been aroused among time-table students in consequence of the appearance in the Western Division time-tables of the London Midland and Scottish Railway of what is apparently a non-stop run from Shrewsbury to Stirling, a distance not far short of 300 miles, conveying the through West Coast coach from Penzance to Aberdeen. The explanation is, however, a simple one. The coach in question is brought from Shrewsbury to Crewe by the ordinary 10.30 p.m. train (actually due at Crewe at 11.15 p.m., though advertised at 11.32 p.m.), and by agreement with the Postmaster-General, it is there transferred to the down West Coast Postal (8.30 p.m. from Euston, leaving Crewe at 11.57 p.m.), which does not convey passengers in the ordinary course. Consequently, although the "Postal" actually calls at Preston, Carlisle, Carstairs and Larbert, no stops are shown until Stirling, reached at 5.25 a.m., where, to the now much reduced postal portion of the train there is attached a passenger portion from Glasgow (Central), at 4.15 a.m., to Aberdeen. Thereafter the express calls at Perth only to Aberdeen, which is reached at 7.52 a.m.

[Reply to E. M. G. and others.]

Unused Mineral Lines : Cleveland District.

We are officially informed that the line referred to was originally known as Dodds Railway, and was taken in hand by a Mr. Dodds, solicitor, believed to be of West Hartlepool. The intention was to connect at the Glaisdale end with the South Cleveland Company, Ltd. Iron Works, with a view to carrying the rich ironstone from the district it would pass through. Before it was actually completed, unfortunately, the South Cleveland Iron Works Company, Ltd. had to close their works for want of capital, and the completion of the Dodds line was also abandoned. It is 40 years or so since the scheme and the works fell through. The gradients would not appear to be more difficult than some on the London and North Eastern Railway today. The contractor for the Dodds Railway was named Waddell, and the line is locally known as Paddy Waddell's railway.

[Reply to H. J. C.]

Signalling at Dainton, Great Western Railway.

We are informed that the down line signals referred to at Dainton comprise an ordinary Distant, and 250 yards in advance of it is a fish-tailed repeating Home signal, the latter signal having been provided

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owing to the heavy rising gradient of 1 in 43 approaching Dainton Tunnel, with a tunnel 272 yards long at the summit of the incline, and the Down Home signal for Dainton Tunnel being just inside the Dainton or west end of the tunnel. It often happens in practice that the driver passes the Distant at "danger," and before repeating Home is reached "Line Clear" has been obtained and the driver is thus given an indication of the position of the Home signal at the exit of the tunnel.

[Reply to A. C. PALMER.]

Express Trains, Southern Railway.

It is doubtful whether any of the factors you suggest operate at all to cause South Western schedules in some respects to compare unfavourably with higher speed performances for corresponding distances on other lines. The difficult gradients certainly count for something, and there is not much work of a higher order than that performed on the West of England route. As regards the Bournemouth line, there are good reasons for including the Southampton stop, but allowing for that, locomotive work is practically as good as in the days of Bournemouth two-hour trains. In regard to the Weymouth and Portsmouth services these actually include very creditable schedules, intermediate traffic being regarded as of equal importance with that throughout.

[Relpy to "SEMYS."]

Disused Line, Hinckley to Stoke Golding.

The 3¼-miles spur connecting Hinckley, on the South Leicestershire branch and Stoke Golding on the Ashby-Nuneaton Joint line, is a part of the latter line, authorised in 1866 and opened in 1873. The Midland Railway was authorised to construct the Ashby-Nuneaton line, and in 1867 it was made joint Midland and London and North Western. During the years whilst the joint line, which has several branches, was under construction, various arrangements for traffic working between the Midland and London and North Western Railways were entered into, which rendered the use of the line between Stoke Golding and Hinckley unnecessary. We believe this line has never been used for regular traffic.

[Reply to R. T. NINNIS.]

Dinmore Tunnel.

We are informed that until 1893 only a single line and tunnel existed at Dinmore, and this was on a gradient of about 1 in 100. When the line was doubled at that date the opportunity was taken of constructing the additional track, which formed the Up road, to a better gradient, namely, 1 in 135. As the two lines are approximately at the same level somewhere near the middle of the tunnel, the Up line, which is on the flatter gradient, is higher than the Down at the Hereford end of the tunnel and lower than it at the Shrewsbury end. The level of the old and new rails again becomes coincident about 1 mile to the south and ¼-mile to the north of the tunnel.

[Reply to Rev. C. T. HARTLEY.]

Somerset and Dorset Joint Railway.

You are probably correct in suggesting that the locomotive coal, ash, and engineers' wagons indicated as duplicates by the letter A, are service wagons which therefore do not appear in the ordinary records of this line, which is in a somewhat special position owing to its joint ownership by the Southern and London Midland and Scottish Railways, and so does not show these numbers quite in the same way as other companies. We note your remark that goods engines are now being painted black. The small numbers shown on the engines indicate the power classification.

[Reply to O. B. MORLAND.]

Traffic Developments on the Southern Railway.

Now that the London, Brighton and South Coast and South Eastern and Chatham lines have come under one ownership, there is no reason for continuing the special arrangements between the two companies by which trains belonging to one company omitted stations belonging to the other, as between Coulsdon and Redhill, or stops were made by certain trains only, as at New Cross, Forest Hill and Norwood Junction by South Eastern and Chatham trains. For the time being, however, alterations of this kind will necessarily occur gradually and stage by stage.

[Reply to C. E. BEAMES.]

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Traffic Working at Worcester.

Apparently the 11.26 a.m. train from Worcester, due in Birmingham at 1.40 p.m., formed the 1.52 p.m. through train for Norwich, Yarmouth, Lowestoft, etc.; hence the fact that the vehicles bore name boards for their special service, although the through facilities thus afforded were not advertised in regard to Gloucester, Cheltenham and Worcester, the train over this stage being a slow one. The route from Birmingham is via Leicester and thence to Bourne, and the M. & G.N. Joint line. The 10.25 a.m. from Bristol includes through carriages for Glasgow, M. & G.S.W. indicating Midland & Glasgow & South Western Joint stock.

[Reply to R. A. ATTHILL]

Signalling at Beckenham Junction.

We do not recognise anything unusual about the signalling at this station. Apparently No. 1 is the Down Outer Home; No. 2 an Inner Home signal to protect the actual junction; No. 3 the Down Starter and No. 4 a Down Advanced Starter. Large 4-4-0 engines can now work to Bromley South from Cannon Street, though not yet throughout the Chatham section. Several L. & S.W. sets of vehicles are now used on the S.E. & C. section. We have no information as to comparative numbers of season-ticket holders on various portions of the S.E. & C. system.

[Reply to "S.E. & C. SIGNALS."]

Signalling at Snow Hill, Birmingham.

The illuminated indicator showing the words "ENG. SPR." indicates that the signal has been lowered to allow access to an engine spur. The letters "C O" on shunt signals indicate the purpose for which the signal is provided. Their meaning is, of course, peculiar to the location, and you can probably find it out for yourself as a Birmingham resident. The new rolling-stock you mention can already be seen on some of the through London-Birmingham and Birkenhead trains.

[Reply to D. F. ANDREWS.]

"Tilbury" Section, L.M.S. Railway.

The 4-6-4 tank engines built a number of years ago proved too heavy for Stepney Bridge, and for that reason their running to and from Fenchurch Street has been necessarily prohibited. Hence, also, the addition to the stock of large 4-4-2 tank engines. You must be mistaken in suggesting that you have seen photographs of the 4-6-4 tank engines in Fenchurch Street station. So far as we are aware, none of them has ever entered the station, unless experimentally when first introduced.

[Reply to L. J. POWER.]

L. & N. E. Locomotives and Rolling-Stock.

"Belmont" points out that certain passenger engines with coupled wheels less than 6 ft. diam. have been painted green, notably the "Glen" class on the North British section. Engine numbers are now being shown with an initial letter, N, E, &c., indicating the section to which they belong, though on the small number plates the locomotive headquarters are stated, the initial letters applying only to the large painted numbers on the tender or tank sides. Horse boxes, &c., are lettered "N.E." only.

[Further reply to A. R. HARRISON and G. F. RAYNOR.]

Great Northern 4-4-2 Tank Engines.

Most of these engines are now employed on country branch lines, a number being used also in the Leeds and Bradford district. In the London area they have been replaced by the 0-6-2 tank engines. The few which are to be seen now and then in London have, presumably, worked thereto from Hatfield, Hitchin and other depôts. But few of the 0-4-4 tank engines are now in service, and these are mostly retained on branch lines.

[Reply to P. G. CUNNINGHAM.]

Midland Train Control.

Space would not permit, either in the RAILWAY MAGAZINE article in October, 1921, or in the booklet published from these offices, of all the abbreviations of departure and destination names being given. As a rule, however, the first and last letters are used on brake vans, and generally they are more or less self-explanatory.

[Further reply to K. A. WERRETT.]

London, Midland & Scottish Locomotives.

The numbers 1, 2, 3 or 4 shown on the cab sides of Midland locomotives indicate

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the power classification, No. 1 class being the highest. The small 4-4-0 locomotives you have observed are early representatives of the "Johnson" class which have not been rebuilt, as is the case with most of their larger successors. They are not converted 2-4-0's. The American-built 2-6-0 locomotives you mention have long since been broken up.

[Reply to P. R. B. (Leeds).]

Double-Heading.

The leading driver has control of the train, but the train engine driver is able to apply the brakes should need arise. The respective drivers can, of course, communicate by signal whistles or by hand signals, and it is doubtful whether there is need for anything more, seeing that each knows his work and should realise his full responsibility. When a banking engine is employed the train engine signals by whistle and the rear engine acknowledges before any move is made.

[Reply to "SUBSCRIBER."]

Piloting.

Presumably, the fact that a 4-4-2 locomotive was piloting a 4-4-0 on the Great Northern section of the London & North Eastern Railway indicated either that the "Atlantic" was going through beyond Potters Bar or that it would be detached at Hitchin or Peterborough. There is no reason, however, why the 4-4-2 engine should not have been rendering pilot assistance to Potters Bar only, though usually 0-6-2 tank engines or 4-4-0 tender engines are thus employed.

[Reply to A.C.]

Old London and North Western Locomotives.

2-4-0 engines *Charles Dickens* and *Hardwicke* belonged to the well-known "Precedent" class. The former is long since broken up, though we believe the latter is still in service, together with a number of engines of the same class. We presume, when mentioning *Ionic*, you refer to the three-cylinder compound which bore that name, belonging to the "Teutonic" class. This is long since broken up.

[Reply to L. M. S.]

Electric Traction in New York.

Both the Pennsylvania and New York Central lines, together with other systems which use their stations operate all trains electrically in New York. The only railways which reach New York proper other than by electric traction obtain their connections with the mainland via the various ferries.

[Reply to F. B. P.]

"The Flying Dutchman."

This name was given to the West of England express from Paddington which for a great many years left at 11.45 a.m., though it has now disappeared, the nearest equivalent being the present 12 noon express. One of the old 4-2-2 locomotives carried this name, and presumably it was this engine you saw at Chester, though that must have been a number of years ago.

[Reply to J. P. BROWN.]

Southern Railway Rolling-Stock.

A number of vehicles, painted green, are now running lettered "Southern Railway," but no statement has yet been issued officially as to the intentions of the company in this respect. Occasionally L.B. & S.C. trains are routed via Redhill without calling, but only for traffic convenience or possibly because of a delay on the alternative line.

[Reply to E. P. BOOTH.]

Southern Railway Train Working.

Owing to the special working between Bognor, Littlehampton and Arundel of the train you mention, it is probable that the staff in London regarded the train as primarily one from Littlehampton. It may be that the local journeys in the Arundel district were regarded as separate journeys, though made by the stock of the through train.

[Reply to J. R. I.]

London and North Eastern Locomotives.

Great Northern 4-6-2 locomotive No. 1471 is still named *Sir Frederick Banbury*. Mr. Cecil J. Allen reports he saw the engine bearing the name-plate over the middle pair of driving wheels as recently as October 8. The other point you raise is dealt with in "What the Railways are Doing."

[Reply to "PRO-G.W.R."]

Locomotive Exchanges.

It was in 1910 that Great Western 4-6-0 locomotive No. 4005, *Polar Star*, and

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London & North Western 4-6-0 engine No. 1471, *Worcestershire*, were exchanged between the companies concerned for comparative trials. See issues of the RAILWAY MAGAZINE for that year for further particulars.

[Reply to J. P. BROWN.]

Colours of Locomotives and Rolling-Stock.

Your suggestions are good, but the practices of the respective companies are settled by the directors, and outside suggestions, especially where decisions have been made already, are hardly justified, however much one may regret that some other policy was not adopted.

[Reply to R. M. SHEPPARD.]

Midland and South Western Junction Railway.

No doubt, in due course, improved facilities, in association with the Great Western Railway, will be given, but so far no particulars have become available as to contemplated developments, or in regard to a suggested service between Swindon Town station and Swindon Great Western station.

[Reply to F. B. P.]

Mail-Exchanging Apparatus.

Speaking generally, all the principal main lines are equipped with mail-exchanging apparatus at or near every station where its provision is justified. You do not give your real name. This should be supplied as an indication of authenticity, though not for publication.

[Reply to "FANCY DRESS."]

French Railways.

Lord Monkswell's book "French Railways," or Protheroe's "Railways of the World" will probably meet your requirements. We have no knowledge of a book dealing specifically with Swiss railways. Please see bibliography in the RAILWAY YEAR BOOK, 1923.

[Reply to D. C. L. P.]

Lickey Incline.

This is not the steepest incline over which passenger traffic is worked, but in regard to steepness and length, practically two miles at 1 in 37, is much the hardest on a main line of railway. Other exceptionally steep sections are mostly on branch lines or are worked for goods traffic only.

[Reply to J. H. M. PEEL.]

New South Wales Rail Motor.

The van attached, as illustrated on page 228 of the September RAILWAY MAGAZINE, is for the conveyance of dairy produce, as mentioned. If you refer to the hand-wheel shown behind the passenger car you will see that this appears to be for the application.

[Reply to K. W. S. M.]

Cross-Channel Steamers.

We understand that the Great Western steamer *St. Patrick* was loaned to the Southern Railway and used in place of their steamer *Cæsarea* temporarily. Hence, the employment of the Great Western steamer on the Southampton and Le Havre route.

[Reply to J. BLAKE.]

Lancashire and Yorkshire Railway Locomotives.

A number of the older engines, of which, we believe, No. 1006 is one, were built by Beyer, Peacock & Company, Ltd., though it is many years since the Lancashire and Yorkshire Railway ordered locomotives from outside firms.

[Reply to J. L. SUTCLIFFE.]

Great Northern Locomotives.

According to "Belmont" all the 0-4-2 tender locomotives have been scrapped, with the exception of a few which have been sold. He mentions that two of them, one being No. 526A, were purchased by Mr. J. F. Wake, of Darlington.

[Further reply to A. C.]

London and North Eastern Railway Locomotives and Rolling-Stock.

Engines and vehicles belonging to the respective sections are differentiated by the addition of a letter—N, E, C, &c., to the number, to indicate the section to which they belong.

[Reply to "CUMBRIAN."]

Speed Restriction Signs, Belgian State Railways.

The boards you mention bearing varying numbers of black stripes indicate the approach to a junction calling for reduced speed, the number of stripes decreasing as the point in question is neared.

[Reply to A. L. B.]

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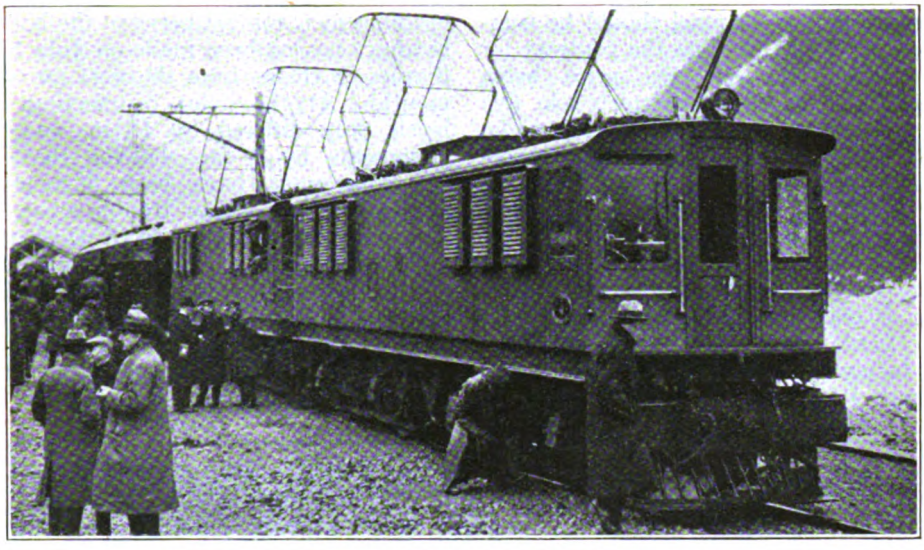

AT ARTHUR'S PASS, AUGUST 4, 1923.

Arrival of the first through train from the west coast.

The Empire's Longest Tunnel.

OPENING OF THE OTIRA TUNNEL, NEW ZEALAND.

THE railway system of New Zealand has from the opening of the first section contained features that appeal to the engineer—both civil and locomotive—to the traveller and to the railwayist. These exceptional features have been added to by the completion of the Otira Tunnel, 5 miles 554 yds. in length, the longest in the British Empire and the seventh longest in the world. In altitude also the Otira Tunnel is above that of the world's longest tunnel—the Simplon, which is 2,313 ft. above sea level, whilst the altitude of the Arthur's Pass portal of New Zealand's long tunnel is 2,435 ft. above sea level.

The tunnel, which was formally opened on August 4, 1923, is by no means the result of a recent decision to connect the North part of the west coast of the South Island, with Christchurch and the east coast generally. For the purpose of assisting gold prospectors in the district a survey was made to find a route over the mountains and Arthur's Pass was located in the spring of 1864. By 1873 a railway through the district connecting the east and west coasts had been sanctioned by the New Zealand legislature. Little, however, was done until 1887 when the New Zealand Midland Railway took over from the Government powers to construct a railway connecting Canterbury with the west coast via Arthur's Pass. Various sections of the railway were completed, and in 1892 the New Zealand Railway was authorised to substitute an incline for the tunnel at Arthur's Pass. Progress was so slow that in May, 1895, the New Zealand Government seized the railway and other property of the Midland Railway Co. Arbitration between the Government and the railway company resulted in terms being arranged in 1901. Meanwhile the New Zealand Government had been proceeding with the construction of the line. By November, 1900, the western section of the railway to the Otira mouth of the tunnel was completed. Progress on the Canterbury side lagged so much that considerable agitation ensued, with the result that in 1905 Mr. Seddon, the Premier,

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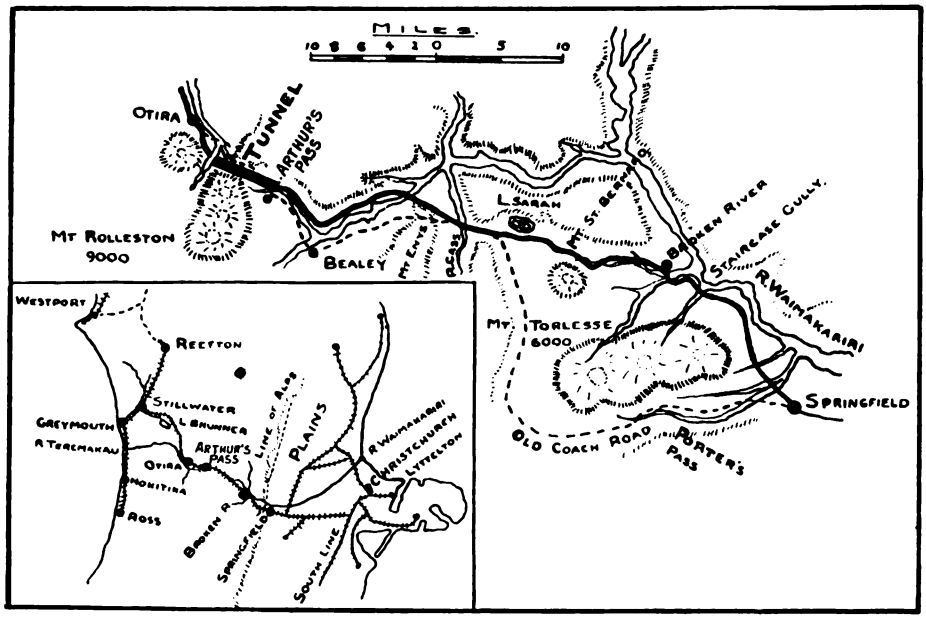
promised that the tunnel should be completed in 1910. In 1907 the contract for the tunnel was let, the price being £599,794, work to be completed in five years. On 5th May, 1908, a start was made, Sir J. Ward, the New Zealand Premier performing the initial ceremony of firing the first blast of explosives. The estimates were: earthwork excavations 10,700 cubic yards, tunnel excavation 312,816 cubic yards, brickwork 5,223 cubic yards, concrete 50,000 cubic yards, masonry 400 cubic yards, stonework 800 cubic yards, rock facing 12,000 cubic yards, and drainage pipe 1,500 linear feet. Being in New Zealand, it was not long before labour troubles developed on the work, although the contractors were paying 10 per cent. above the agreed trade union rates. After various strikes, etc., the contractors asked to be relieved of their contract and at the end of 1912 the request was acceded to. On 6th January, 1913, the New Zealand Public Works department commenced operations and proceeded with construction from the points reached by the contractors, who had pierced in all 2 miles 30 chains of the distance. Progress, such as might be expected under such conditions, was made, so that it was not till 21st August, 1918, that the two chief headings met, contact between the bottom headings having been made on July 20th, 3 miles 68 chains from the west (or Otira mouth). At the point of meeting, the levels only differed by $1\frac{1}{8}$ in. and the alignments by $\frac{3}{4}$ in., showing that the surveying must have been particularly accurate. More labour trouble arose, the men complained of the wet in which they had to work and of the cold draughts of air that swept through the tunnel. The pay was good, from 22s. $10\frac{1}{2}$d. for $5\frac{1}{2}$ hours work a day—this was the average daily pay of tunnellers for a period of eight months. "Ca Canny" was then so rife



MAPS SHOWING LOCATION OF OTIRA TUNNEL.

that it was expected five years would pass before the tunnel was completed. As a matter of fact this was the time occupied.

The tunnel, which is straight from end to end, has a gradient throughout of 1 in 33 rising from the Otira end, the total rise is 850 ft. There is also a stiff rising gradient approaching the west entrance, the average gradient of the whole incline being 1 in $37\frac{1}{2}$. The tunnel is 15 ft. 6 in. high at centre, 14 ft. wide at rail level, and 12 in. wider at 6 ft. 3 in. above rail level. The sides are concrete lined throughout 12 in. thick. The roof has been lined with concrete at places, with blocks 18 in. thick. Greatest depth below the surface

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is 1,150 ft. The tunnel is only wide enough for a single line of 3 ft. 6 in. gauge railway. The rails through the tunnel weigh 100 lb. per yard, this heavy weight is employed because of the excessive wear that will arise from breaking the trains. The trains are worked through the tunnel by electric locomotives. The electrical work has been carried out by the English Electric Co. Ltd.

The Power House is at Otira, coal is employed to generate the steam for two turbines, each of 2,000 h.p.; they are geared down to drive the dynamos at 450 r.p.m. The electrical output is 1,200 kw., voltage 1,650. In addition to the line motives have been supplied for hauling passenger and freight trains, as well as a battery locomotive for inspection, shunting, etc. The five locomotives are of the same type, *i.e.*, standard Dick Kerr, 82 totally enclosed forced ventilation type. The four main motors develop 170 h.p. at the tread of the wheel at the one hour rating, so that each locomotive has 780 h.p. They are wound for 750 volts and connected in permanent series. Reverser and other parts of the control equipment are of the usual type. The steep gradient has been responsible for the locomotives being fitted with four brakes each, a

SCENE AT OTIRA STATION, AUGUST 4, 1923.

Greymouth (left) and Christchurch (right) trains ready to depart.

through the tunnel, 5¼ miles in length, the railway has been electrified for three miles (to Otira) on the west side of the tunnel, whilst the sidings at Otira and at the Arthur's Pass mouth of the tunnel necessitated together about five miles of electrification, so that about 13 miles of single track are electrically operated. The signalling apparatus through the tunnel is of the type used on the London Tubes, modified for single line working, and has been supplied by the Westinghouse Brake & Saxby Signal Co., Ltd. The current is supplied to the locomotives by overhead catenary equipment placed from 14 ft. to 18 ft. above the rails. Five electric locorheostat, Westinghouse automatic, Westinghouse straight air and a hand brake. Because of the small number of trains the rheostatic brake was adopted in preference to the regenerative brake, because the power house supplies only the railway load, and there would, therefore, be occasions when there would be no load to absorb the regenerated energy. By means of the rheostat brake, also, the locomotive is rendered independent of the trolley voltage.

Current is collected by means of two air-operated pantographs raised by compressed air and floating on springs. The locomotives weigh 50 tons each. Two locomotives, driven by multiple control,

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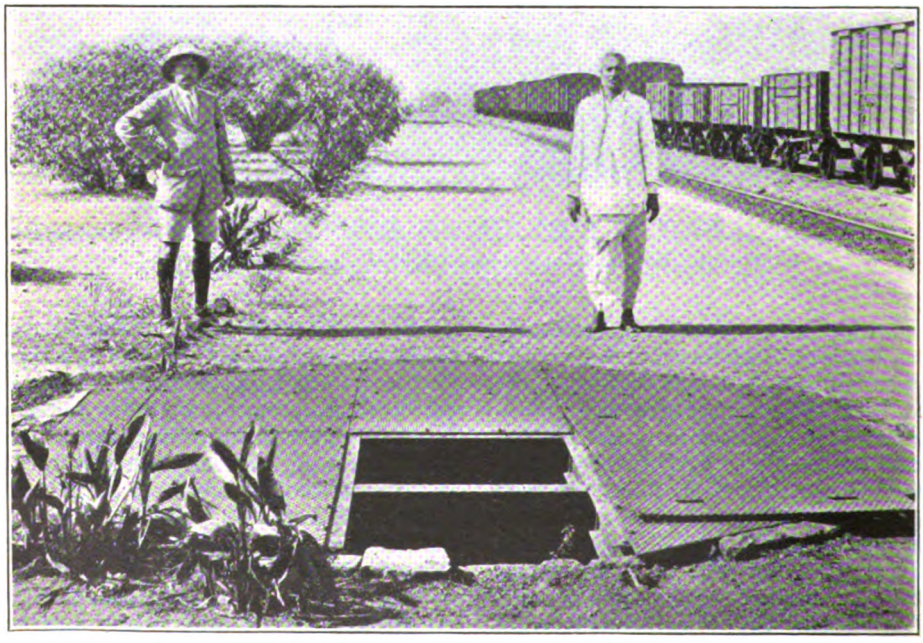
are used for freight trains and one for passenger trains. The speed is 18 m.p.h. on the rising gradient of 1 in 33 and through the tunnel is restricted to 25 m.p.h. in the opposite direction.

For the official opening a special train left Christchurch with M.P.'s and other important guests, at 8.35 a.m. on August 4th. The Arthur's Pass mouth of the Tunnel is 87 miles from Christchurch. Here the special was met by guests from the west side of the Island, who had already passed through the tunnel. The photo on page 375 depicts this train (the first to pass through the tunnel) at the Arthur's Pass portal. The two trains passed through the tunnel to Otira, 16 minutes were occupied by the specials in passing through the tunnel. A luncheon was served at Otira, and from the balcony of the power house the New Zealand Premier (Rt. Hon. W. F. Massey) declared the tunnel open for traffic. Trouble was experienced from wet, which affected the insulation of the wires, and delayed the commencement of the return journey till 5.20 p.m. On the up grade two electric locomotives occupied 21 minutes in hauling the special through the tunnel.

The public service between Christchurch and the West Coast commenced on August 7th. The train leaves Christchurch on Tuesdays, Thursdays and Saturdays at 9.5 a.m., is due at Arthur's Pass at 1.28 p.m. and departs Otira (25 min. allowed for lunch) at 2.25 p.m., being due at Greymouth at 4.15. The distance is 145 miles. The return train leaves Greymouth at 10.15 a.m. and reaches Christchurch at 5.30 p.m. with a stop of 25 min. for lunch at Otira. It is proposed to run a train in each direction on Mondays, making four a week. Prior to the opening of the tunnel, passengers travelled by road coach between Arthur's Pass and Otira.

A SUTIE RELIC AT AN INDIAN RAILWAY STATION.



TALGARIA STATION PLATFORM, BENGAL-NAGPUR RAILWAY.

In the foreground, covered by the iron plates, lies the relic of a Sutie. Sutie was the custom whereby Hindu wives allowed themselves to be burnt alive on the funeral pyre of their dead husband. This spot is a sacred one. Pilgrims visit this relic, indifferent to the railway work that may be taking place.

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Southern Railway's London-Paris Services.

IN the co-ordination of Continental Services the Southern Railway has made greater progress in fixing the various services run by the three companies forming the group than is to be found elsewhere in the assimilation of pre-grouping competing services amongst the "Big Four."

The extent of this re-arrangement of services will be best appreciated by a comparison of the services existing in the summer of 1914, and those that came into force, with the withdrawal of summer time in France, on October 7th.

Prior to grouping there had been keen competition for the London-Paris traffic, and each route claimed certain advantages. Although the Paris traffic carried by the S.E. & L.C. & D. Railways was previous to the working union, subject to division by agreement, the terms of this document allowed so big a sum to be deducted from the fares for working expenses, before the balance came into the pool, that it paid the two railways to compete strenuously for the conveyance of passengers.

But with the cessation of this competition that of the Newhaven–Dieppe route increased, bigger and faster boats were employed, quicker connecting trains were run, and in later years a considerable shortening of the route between Paris and Dieppe was made by the opening of the direct line via Pontoise, whilst always the fares via Newhaven were appreciably less than via the Dover and Folkestone routes.

The Southampton–Havre night service although scarcely competitive, was favoured by those who found the time of departure or port of embarkation more convenient than those obtaining with other services.

A striking feature in the post-war services probably as the result of war arrangements, but chiefly influenced by the closing of the S.E. section line between Folkestone and Dover, by a land-slide in December 1915—is the concentration at Victoria of all arrivals and departures by the S.E. & C. section routes. The route via Orpington loop and Tonbridge is chiefly used; of 49 conditional times (up and down) between Victoria and Folkestone and Dover 36 use this route. In July, 1914, of the 12 services by the Dover and Boulogne routes five departed and five arrived at Charing Cross, and only one each way at Victoria. It was not till January 8, 1920, that the Dover–Calais route was re-opened for civilian passengers, Victoria being the station for arrivals and departures. From the same date the Folkestone-Boulogne services, which up to this time had used Charing Cross, were transferred to Victoria. Subsequent additions to both the up and down services all have had Victoria as their London station.

The 1914 departures from London were :—From Charing Cross via Dover at 9 a.m., 4.30 p.m., and 9 p.m., and at 10 a.m., and 2.5 p.m. via Folkestone. At 11 a.m. there was the only departure from Victoria, the service being via Dover. The quickest service was by the 4.30 p.m. from Charing Cross, which reached Paris at 11 p.m. This service, which was re-introduced on 7th October, 1923, is also the fastest at the present time, but occupies 6 hours 55 minutes, against 6 hours 30 minutes in 1914. The Paris–London service by the late S.E. & C. Railway comprised arrivals timed to reach Charing Cross via Dover at 5.10 p.m. and 5.43 and 10.15 a.m., and via Folkestone at 3.25 and 10.45 p.m. Victoria received its only service (via Dover) at 7.5 p.m. The quickest service was that due at Charing Cross at 10.45 p.m., which left Paris at 4 p.m. One Folkestone service in each direction (10 a.m. ex Charing Cross and 8.25 a.m. ex Paris) called at Tonbridge, to give connections via Reading with the Great Western Railway and the Midlands and the North of England.

The late L.B. & S.C. Railway route to Paris (via Newhaven) in July, 1914, had two services with the same number from the French capital. The morning service left Victoria at 10 a.m., and reached Paris (via Pontoise, 224 miles) at 5.59 p.m., the evening train departed at 8.45 p.m. and was due at St. Lazare at 6.3 a.m. From Paris the trains were at 10 a.m., and 9.20 p.m., the Victoria arrivals being shown as

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6.10 p.m., and 7.30 a.m. Pullman buffet cars were run in all the services (up and down) between Victoria and Newhaven.

The late London & South Western Railway service of 1914 was performed once each week-day in both directions. The train left Waterloo at 9.50 p.m., passengers travelling by boat between Southampton and Havre. The arrival at Paris was 11.24 a.m. The return service left Paris at 7.48 p.m., passengers being due to reach Waterloo at 10.11 a.m.

The service of the Southern Railway which came into operation on 7th October last combines the salient features of the services previously provided by the three partners with a total of 7 in each direction, as compared with the 9 in each direction in 1914.

The London departures are now as follows:—From Victoria (S.E. & C.) 9.15 a.m. via Folkestone, 11 a.m., via Dover and Calais, 2 p.m. via Dover and Boulogne and 4.30 p.m.,* via Dover–Calais. From Victoria (L.B. & S.C.) via Newhaven at 10 a.m., and 8.20 p.m., and from Waterloo at 9.30 p.m., via Southampton–Havre.

The return services reach Victoria (S.E. & C.) at 3.20 p.m. (via Boulogne and Dover) 5.10 p.m., via Calais–Dover†, 7.15 p.m. via Calais and Dover, and 10.40 p.m. via Boulogne and Folkestone. The last is the quickest service, the journey of 262 miles being performed in 6 hours 40 minutes.

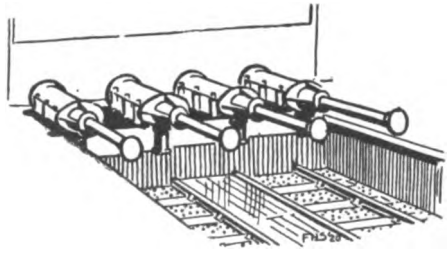
The Dieppe–Newhaven services leave Paris at 10.36 a.m., and 8.45 p.m., reaching Victoria (L.B. & S.C.) at 6.40 p.m. and 6.4 a.m. This accelerated night service from St. Lazare is an important one conveying French mails, and enabling them to be delivered in London by the time business commences.

The Havre-Southampton service leaves Paris at 7.40 p.m., and is due at Waterloo at 9.15 a.m., an acceleration of 48 minutes on the pre-war timing.

The chief feature of the present service is the withdrawal of one service in each direction via Folkestone – Boulogne. It was at one time rumoured that as a result of the formation of the Southern Railway, the Newhaven–Dieppe service would be withdrawn. There is, however, an agreement between the French State Railways and the late L.B. & S.C. Railway in respect of this service that insures its continuance for several years. Economy already effected by curtailing the Folkestone service is continued. The Dover–Boulogne services are a survival of services inaugurated during the war, and reduce the importance of Calais as a cross-Channel port. The present services, two each way to and from Calais and the same number to and from Boulogne enable a much better daily mileage to be obtained from the steamers engaged in these services.

* Commenced October 7th; to October 6th there was a departure from Victoria (S.E. & C.) at 8 p.m., via Dover and Boulogne, due Paris at 5.15 a.m.

† Started October 7th (Paris dep. 10 a.m.); up to October 6th there was a departure from Paris at 11.45 p.m. due Victoria (S.E. & C.) at 9.30 a.m.



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New Jetty and China-Clay Loading Appliances at Fowey, G.W.R.

THE Great Western Railway has brought into service at Fowey a new jetty equipped with an electrically-operated belt conveyor to improve the appliances there for transferring china-clay from trucks to vessels, and the completed work is one of the finest, if not the finest, of its kind in the country.

Fowey is the principal port of shipment for china-clay, which is mainly produced in mid-Cornwall, although a certain quantity emanates from the Leemoor district of Dartmoor, which is chiefly shipped at Plymouth. There are no docks at Fowey ; jetties are T-shaped, built out into the river, vessels lying alongside the short head. Hitherto the jetties have been seven in number, constructed of timber between the years 1874 and 1895. The first three erected in 1874 were used principally for iron ore traffic, but a china-clay boom occurred soon afterwards, and the decline of the iron ore business altered the use of the jetties completely. In the year 1880 china-clay shipments amounted to 81,000, whereas last year the figure had increased to over 600,000 tons.

Originally equipped with tipping shutes at the jetty head for bulk china-clay and steam cranes for loading clay in casks or bags, these jetties met requirements so long as vessels up to about 300 tons were engaged in the trade, trans-ocean consignments being taken to Liverpool or some other port for shipment into larger vessels as part cargo. The advent of steamers of greater tonnage for direct carrying overseas proved the loading facilities to be inadequate, and it became necessary for tipping operations to be suspended for varying periods before and after high water owing to ship side being above the level of the shutes, making loading impossible.

To overcome these conditions the company equipped one jetty—known as No. 4—with an electrically-worked belt conveyor with a tipping shute capable of being raised or lowered according to the state of the tide or the height of the side of the vessel. This conveyor, which has a maximum capacity of 240 tons an hour compared with the 200 to 300 tons per day of the appliances at the other jetties, was brought into use in October, 1909, and the improved rate of loading, with consequent reduction in delays and demurrage, had the effect of inducing freighters to employ in the china-clay overseas trade still larger vessels, even to a carrying capacity of between 8,000 and 9,000 tons.

This fact, and the prospective development of the china-clay industry, anticipated by the opening up of many extensive new workings, led the Great Western Railway Company, before the war, to determine upon the construction of a new jetty, the old jetties not being of a suitable character for alteration, and to equip it with an electrical conveyor, the installation on No. 4 jetty having proved so successful.

The site selected is near Carne Point where, due to the bend in the river with the stream on the railway side, a deep water berth is available. The new jetty is built at a sharp angle from the shore, and its length of 500 feet, with a straight frontage of 300 feet, enables the largest type of vessel dealt with in the port to lie alongside for its full length and to be moored fore and aft, thus giving security against the strong " swinge " of the tide at this point, and avoiding the need for dolphins.

The deck of the jetty is 50 feet wide and is constructed of steel girderwork, with a filling of brick arches and cement concrete ; and it is supported on 23 steel cylinders, 6 ft. diam., sunk to the rock and afterwards filled with concrete. In the case of one cylinder it was necessary to go down 85 feet below high water before rock was reached. A system of timber fender piles is fitted to the sea face of the jetty for the protection of the structure and also of vessels using it. Power for operating the conveyor, which has a maximum capacity of 240 tons an hour, is supplied from the generating station previously erected, which has been enlarged and equipped with additional plant.

Trucks containing bulk, or loose, clay pass at the shore end of the jetty on to a table to which they are secured by hooks, working in conjunction with bolts which

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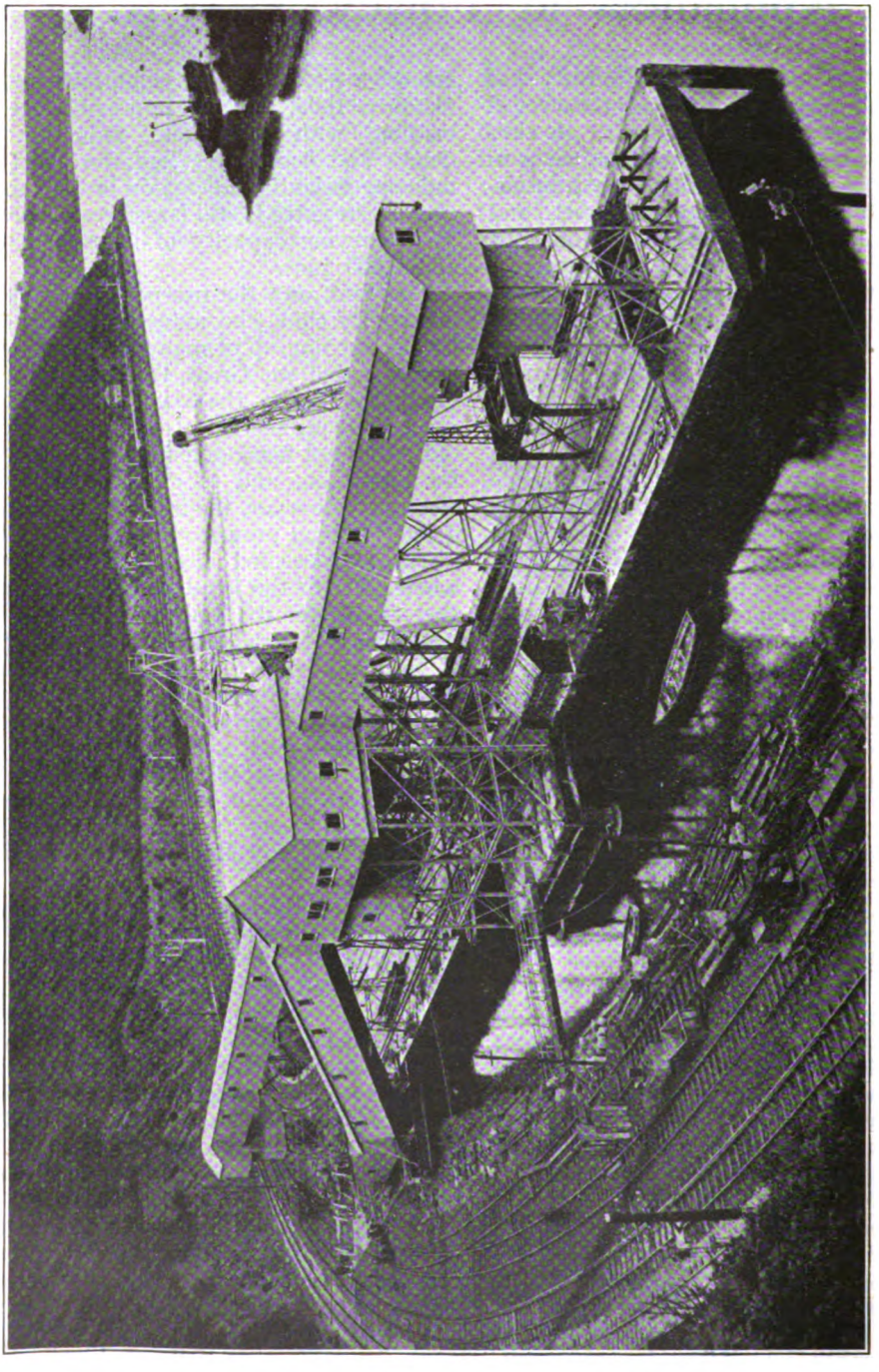

VIEW LOOKING DOWN ON NEW JETTY AND ELECTRIC CONVEYOR AT FOWEY, G.W.R.

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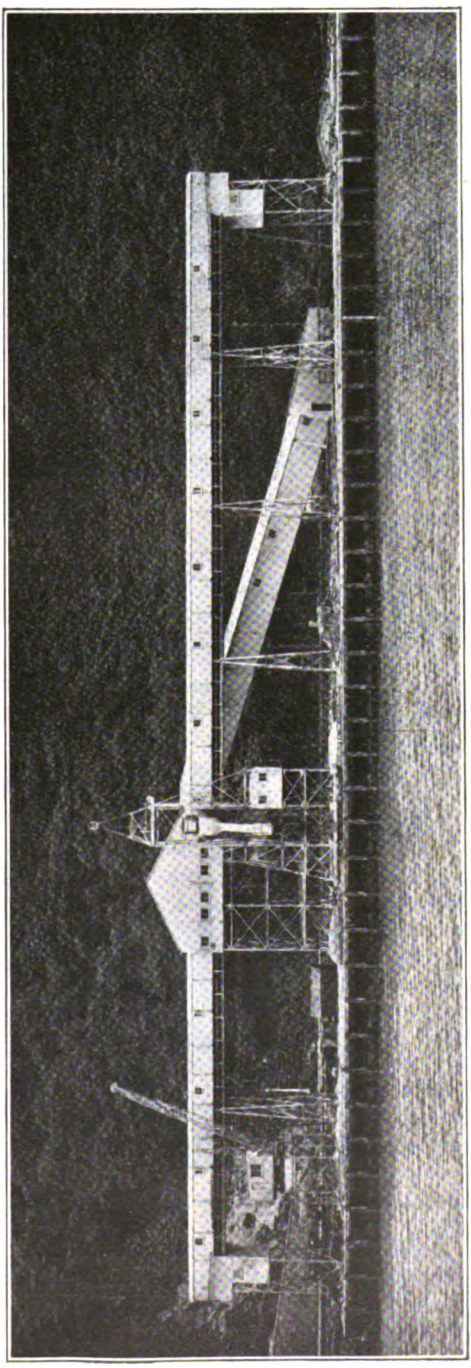
hold the table in position. The table can be tipped to a sufficient angle to ensure the whole of the load being discharged from a truck without man-handling. The clay is deposited in a hopper constructed within a silo and passes thence on to an endless belt travelling at a rate of about 125 feet per minute, by which it is conveyed to a height of 35 feet above jetty level. It is transferred by a traverse belt to an adjustable belt working in conjunction with a movable portal tower, and thence into a shute which discharges into the ship. The shute is hinged and its height and angle can be regulated by the varying position of the hatchway according to the beam of the vessel and the rise and fall of the tide. The end of the shute is fitted with a trimming nose arranged to revolve completely and deposit the clay over a much wider area in the hold, thereby lessening trimming by hand.

The movable tower can traverse the greater part of the frontage of the jetty and serve the various hatchways in succession, continuous loading being practicable, the vessel not requiring to be moved after being once placed in position for its cargo, thus eliminating the loss of time incurred at the other jetties in shifting vessels to bring each hatchway in turn under the shute. The silo itself is circular in shape, 40 ft. external, 34 ft. 6 in. internal diameter and 23 ft. from rails to floor. It is formed of two steel skins strongly braced together, the space between being filled with concrete. The silo is founded on four cylinders sunk to the rock. This construction was necessary to ensure watertightness.

A 3-ton portal electric travelling crane has been provided on the jetty, on which two sidings are laid for its entire length, to enable clay in casks and bags to be shipped simultaneously with the bulk clay. Movement of trucks on both the shore and the jetty is performed by electric capstans, this method of shunting being more rapid and satisfactory than the former system of horse shunting. The conveyor structure and silo are designed to admit of ready duplication of the appliances when circumstances render this necessary. In order to maintain a continuous flow of traffic to the silo, storage sidings to hold an additional 200 trucks have been laid down, this having involved the purchase of land and the cutting away of the hillside.

Work upon the jetty had made good progress when it was commandeered by the Admiralty for war purposes, and upon



ELECTRIC CONVEYOR AT FOWEY, G.W.R., VIEW TAKEN FROM OPPOSITE BANK OF RIVER.

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LORD MILDMAY OF FLEET STARTING THE BELTS WORKING.

its release conditions in regard to materials and labour had so advanced that the total cost of construction has amounted to no less than £200,000. The jetty was constructed by the Cleveland Bridge & Engineering Company, of Darlington, to designs by the Great Western Railway Company's Chief Engineer, Mr. W. W. Grierson; and Spencer & Co., of Melksham, were the contractors for the conveyor designed by the company's Electrical Engineer, Mr. Roger T. Smith. The electrical equipment for the conveyor was supplied by Laurence Scott & Co. Ltd., Norwich.

The opening ceremony took place at noon on Thursday, September 27, in the presence of a large gathering representative of the china-clay industry, the Fowey Harbour Commissioners, and the Great Western Railway Company. A truck of clay was in readiness on the tipping table and was up-ended and emptied into the silo. Lord Mildmay of Fleet, a director of the Great Western Railway, then started the belts working from the bottom and the clay was carried over the belts to the ship. The guests then inspected the conveyor, the power house, the jetty and the electrical appliances, and were afterwards entertained to luncheon at the Fowey Hotel, the Rt. Hon. Lord Mildmay of Fleet presiding.

A TYPICAL MODERN GOODS TRAIN.

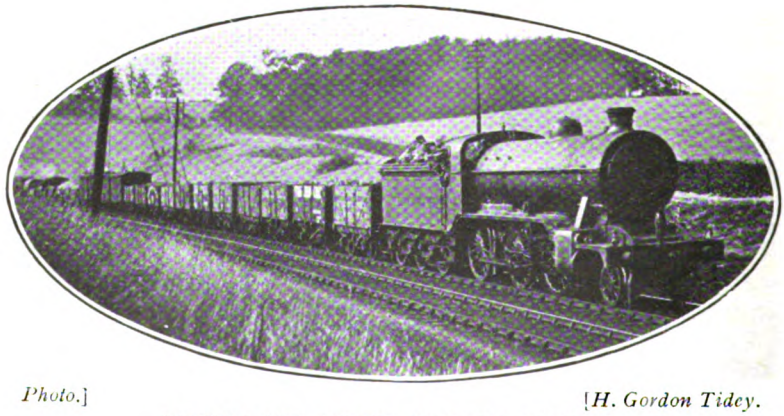

Photo.] [*H. Gordon Tidey.*

LONDON AND NORTH EASTERN RAILWAY.

Up goods train on Great Northern Section. 2–6–0 locomotive, No. 1682.

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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

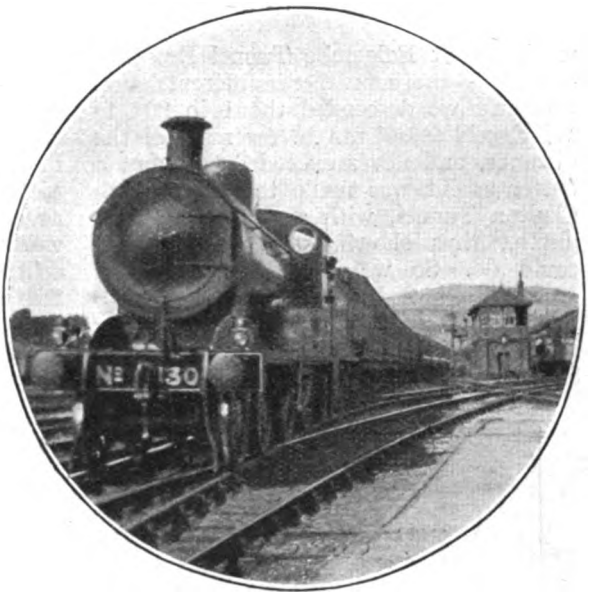

Photo.] [*G. Whitaker.*

LONDON MIDLAND AND SCOTTISH RAILWAY.
Furness section train entering Carnforth.
4–4–0 locomotive, No. 130.

IN an endeavour to overtake very serious arrears in the matter of locomotive performance data, it is necessary to hold over some notes on "practice" that I had in mind, and to lose no time in getting on with the description of certain random runs which I have enjoyed over the Southern Railway during the past summer, with the aid of travelling facilities kindly granted by the Joint General Managers of that line. It is the South Eastern and Brighton sections which are dealt with in the present article, and as the South Eastern runs are not quite completed at the time of my beginning to write these notes, I will commence with those over the Brighton line. I may say at the outset that on not one of the runs about to be described was the driver aware that his work was being timed.

Amongst the expresses timed there figures the ever-popular "Southern Belle," and rightly so, as this is beyond doubt the heaviest daily duty on the railway concerned, during the summer months at least. The growth of this express in the matter of rolling-stock seems still to be sure, even if slow; on the day on which I travelled—a Monday in July—we took out on the 11 a.m. working 7 eight-wheeled and 3 twelve-wheeled Pullmans and a bogie brake, totalling 358 tare tons. With a very full load of passengers, seated four abreast in almost all the third Pullman cars, our gross load, in this 50-axle train, must have totalled nearer 380 than 375 tons; the engine was 4-6-4 tank No. 328. By reason of permanent way checks at Clapham Junction, beyond Balham and at Preston Park we lost 4 min. 10 sec. on schedule time, but the net time was not less than 60 min., and with all allowance for load I have known more enterprising running on the "Belle" than was displayed on this occasion. After passing Clapham Junction in 6½ min., we took 18 min. 40 sec. to Croydon, 10·5 miles, speed after the two delays first-mentioned not rising above 48 m.p.h. at Thornton Heath and Windmill Bridge; but from Purley Oaks to Purley we were running at the merest shade under 50 m.p.h. on the 1 in 264 up-grade. Coulsdon, 15 miles, was passed in 24¼ min., and the last stretch of the ascent to Quarry Tunnel, at 1 in 165, brought us down to 45 m.p.h. On the falling grades to Horley, however, the work was disappointing, speed not rising above 67 m.p.h., while the

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minimum at Balcombe Tunnel Box was 44 m.p.h.—another rather indifferent figure. Similarly we descended the 1 in 264 to Wivelsfield at 64½ m.p.h. for most of the distance, and never exceeded 66; but a better ascent was made to and through Clayton Tunnel, with a minimum of 51 m.p.h., thus showing what the engine could do. So we passed Quarry Box, 18·8 miles, in 29¼ min.; Earlswood, 21·9 miles, in 32 min. 10 sec.; Horley, 26 miles, in 36 min.; Three Bridges, 29·6 miles, in 39¾ min.; Balcombe Tunnel Box, 31·9 miles, in 42¾ min.; Hayward's Heath, 38 miles, in 49 min.; Keymer Junction, 41·2 miles, in 51 min. 55 sec. (we had maintained exact time from Windmill Bridge, Croydon, to this point); we then left Clayton Tunnel South End, 46·2 miles, 57 min. 20 sec. after the start, and passed Preston Park, 49·6 miles, in 60 min. 55 sec., arriving, as previously mentioned, in 64 min. 10 sec.

Photo.] SOUTHERN RAILWAY. [*F. E. Mackay.*

5.20 p.m. Eastbourne Express leaving Victoria, Brighton Section.
Rebuilt 4–4–0 locomotive, No. 52, Class "B 4," superheated.

An up journey on the 12.20 p.m. express behind No. 327, *Charles C. Macrae*, was a more satisfactory experience. This express was made up to 49 axles, including two Pullmans and a six-wheeler, and the tare load of 301 tons, again very well filled, was, in virtue of its being chiefly light non-corridor stock, increased by passengers and luggage to round about 350 tons in all. Up the 1 in 264 to Clayton, after passing Preston Park in 3 min. 40 sec., we accelerated gradually to 48 m.p.h., and then reached 64½ m.p.h. at Hassocks, 68 at Burgess Hill and 71½, well sustained, beyond Wivelsfield; excellent climbing then took us up the 1 in 264 to Balcome Tunnel Box at no lower rate than 55½ m.p.h., while the maximum at Horley was 68 m.p.h.; finally we went up to Quarry Box at no lower speed than 54 m.p.h., left the tunnel at 50½, and touched 68 at Purley before slacking for Croydon, where we had just a minute in hand. Passing times were 8½ min. to the south end of Clayton Tunnel, 11 min. to Hassocks, 13½ min. to Keymer Junction, 16 min. 20 sec. to Hayward's Heath, 22¾ min. to Balcome Tunnel Box, 25 min. 5 sec. to Three Bridges, 28 min. 20 sec. to Horley, 32 min. 20 sec. to Earlswood, 35 min. 40 sec. to Quarry, 39¾ min. to Coulsdon, and 44 min. to East Croydon, after which we simply ambled down to Clapham Junction, passed, after the Balham slack, in 54 min. 25 sec. So Victoria was reached in 59 min. 25 sec., or a little over 58 min. net.

The best of my runs, however, was one

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on the recently accelerated 5.5 p.m. from London Bridge to Eastbourne, wherein another 4-6-4 tank—No. 330—had a well-filled 46-axle train of 290 tare tons, and about 320 tons full. We were gradually gaining on time all the way, and in consequence ran into the signals of the 5 p.m. Brighton 60-minute train, which is only 5 min. ahead to Keymer, as we approached Horley. We were through New Cross, 2·8 miles, in 5 min 5 sec., at 54 m.p.h., but fell to 36½ m.p.h. on the 1 in 100 (2⅝ miles) of Brockley Bank, taking 8 min. reeled off in 9 min. 35 sec., at an average of 67·6 m.p.h., and we were through Three Bridges 2¾ min. early.

This haste meant, of course, signals on from the 5 p.m. down, which spoiled the ascent to Balcombe, but beyond Hayward's Heath we were again up to 71½ m.p.h., ere we reduced severely for the diverging line at Keymer Junction. Here we were nearly 3 min. early, and the very easiest running down past Plumpton and Cooksbridge, with no higher maximum than 64½ m.p.h., as well as a signal check to

Photo.] **GREAT WESTERN RAILWAY.** [*F. E. Mackay.*

Down Birmingham and North express.
Four-cylinder 4–6–0 locomotive, No. 4070, "Neath Abbey."

50 sec. to Forest Hill, 5·6 miles, 14¼ min. to Windmill Bridge, where we were doing 55½ m.p.h., and 14 min. 55 sec. to Croydon, 10·3 miles, which we passed a minute before time. The engine was then eased somewhat; before South Croydon we had fallen to 49½ m.p.h., and on entering Quarry Tunnel to 41½ m.p.h.; passing times were 20 min. 35 sec. to Coulsdon and 25¾ min. to Quarry Box. After that we had a demonstration of what these engines can do in the matter of speed, as we passed Earlswood at 69 m.p.h., Salfords Halt at 74 and Horley at a well sustained 77½, while we had not fallen below 65 on the rising grades beyond when we passed Three Bridges; the 10·8 miles from Quarry to Three Bridges, indeed, were walking pace outside Lewes, did not prevent us from stopping at the latter town 60 min. 40 sec. after leaving London Bridge, or in 58 min. net, for the distance of 50 miles. An equivalent net time to Brighton would have been a shade under 57 min. Intermediate passing times were 28 min. 40 sec. to Earlswood, 32 min. 10 sec. to Horley (where our load was reduced by the loss of our slip portion to 220 tons), 35 min. 20 sec. to Three Bridges, 38 min. 5 sec. to Balcombe Tunnel Box, 44 min. 10 sec. to Hayward's Heath, and 47 min. 10 sec. to Keymer Junction.

At Lewes, owing to lack of time, I alighted, in order to return by the 6.40 p.m. train, with a 51-min. non-stop run to East Croydon. This proved to be a light

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formation of five vehicles only, with a gross load of only 145 tons, and so afforded the easiest of tasks to one of the superheated 4-4-2 tanks, whose number I omitted to note. We mounted the adverse grades to Keymer in excellent style, attaining 59 m.p.h. at Plumpton, and only falling to 53½ before we were brought to a dead stand for 10 sec. by adverse signals at Keymer Crossing. Nevertheless we passed the junction in exactly the booked time of 14 min. Thence we kept closely to sectional times as far as Earlswood,

I made one journey over the Portsmouth road, and found the 11.35 a.m. down made up to eight bogies, including two Pullmans, weighing 225 tons full—no light task for one of the small rebuilt 4-4-0's over the extreme difficulties of this route. We kept the booked time of 16 min. to Mitcham Junction, passing Clapham Junction in 6 min. 5 sec., and Balham Junction in 9 min. 50 sec.; but on the 2½ miles at 1 in 90-86 up to Sutton we fell to 23½ m.p.h., and so took 22 min. 10 sec. to that station, 12 miles, 27 min. 35 sec. to the

Photo.] GREAT WESTERN RAILWAY. [*J. Pitt.*

0–6–4 Tank engine, No. 1357 (originally Barry Railway, No. 148) on Barry-Rhymney mineral train. Rebuilt with Great Western boiler and mountings.

accelerating to 51 m.p.h. up the 1 in 264 past Hayward's Heath, maintaining that speed to Balcombe Tunnel Box, and not exceeding 67 m.p.h. to Horley; Hayward's Heath was passed in 18 min. 10 sec., Balcombe Tunnel Box in 25½ min., Three Bridges in 27 min. 55 sec., Horley in 31 min. 10 sec., and Earlswood in 35 min. 35 sec., at 57 m.p.h. Another good climb was effected to the North End of Quarry Tunnel, with a minimum rate of 50½ m.p.h., after which we ran very easily, and for a considerable distance without steam; Quarry was passed in 39 min. 5 sec., Coulsdon in 43½ min., and despite signal checks we stopped at Croydon in 49 min. 55 sec. from Lewes. Net time was probably about 47 min., or 4 min. inside schedule.

L.S.W. Junction at Epsom, and 37½ min. to Dorking, 23·9 miles, where we were 1½ min. "down." Speeds were 54 m.p.h. before Epsom, and 61½ at Leatherhead, with an intervening slack to 30 at Epsom, and about 45 through Dorking. At the top of the first sharp rise after Dorking (1 in 90–80) we fell to 40 m.p.h., and on the second, at Holmwood (3½ miles at 1 in 100), we fell to 30, after which we were not allowed to exceed 64½ m.p.h. on the winding descent to Horsham; Holmwood was passed in 44 min. 55 sec., and Horsham, 37·3 miles, at 40 m.p.h., in 55 min. 5 sec. Even then the grading troubles are not over, as there are several sharp pitches to be negotiated before the level along the coast from Ford onwards is reached. So

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speed fluctuated from 54 m.p.h. beyond Horsham to 43½ at Itchingfield Junction; then 59 and 51½ before 60 at Billingshurst, 48½ at Gray Lane, 64 at Pulborough, 50 (slack) at Hardham Junction, and between 58½ and 51 from there onwards to Barnham Junction, where we had won back to time. Passing times were 67 min. 25 sec. to Pulborough, 49·6 miles, 76 min. 40 sec. to Arundel, 58 miles, and 84 min. to Barnham. After that the rest of the run was spoiled by delays in connection with Goodwood race traffic, and we took 93 min. to Chichester, 69·2 miles, and 109¾ min. to Havant, 78 miles, whence we regained 70 sec. to Fratton. taking 117 min. 35 sec. for the 84·4 miles' run, instead of 110 min.

I did not get an opportunity during these trips of seeing the new superheater rebuilt 4-4-0's of the "B.4" type at work, but by the courtesy of a Brighton correspondent I am enabled to reproduce the following log of No. 55's exploits on the 3.10 p.m. down "Belle," with an eight-Pullman load of 283 tons tare, and round about 300 tons full. Clapham Junction was passed in 5 min. 35 sec., Balham Junction in 8¼ min. (at a minimum speed of 46 m.p.h.), East Croydon in exactly 15 min., Coulsdon in 20¼ min., and Quarry Box in 25¼ min., the lowest rate on the ascent having been 43 m.p.h.. The engine now displayed a handsome capacity for speed, working up to 80 m.p.h. at Horley, between mile-posts 25 and 26; Earlswood was passed in 28 min. 5 sec., Horley in 31 min. 25 sec., Three Bridges in 34¾ min. (2¼ min. early), mile-post 31¾, at the north end of Balcombe Tunnel, in 37 min. 10 sec., at a minimum of 53 m.p.h., and Hayward's Heath in 42¾ min., at 75 m.p.h. Severe signal checks were experienced at Keymer Junction (passed in 45¾ min., 3¼ min. early) and Burgess Hill, but for all that Hassocks was passed in 50¼ min., Clayton Tunnel was left at a minimum rate of 48 m.p.h., Preston Park was passed in 56 min. 50 sec., and Brighton was reached in 20 sec. under the hour. It is safe to presume that the net time for the 50·9 miles from Victoria was not more than 56½ min., and the rebuilt engine thus gave a very satisfactory account of herself.

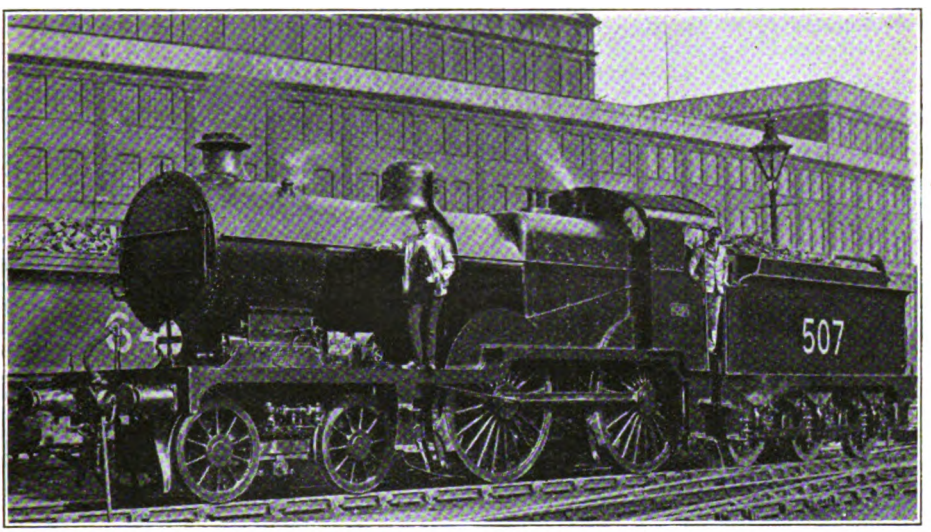

Photo.] SOUTHERN RAILWAY. [*F. E. Mackay.*

South Eastern & Chatham Rebuilt 4–4–0 locomotive, No. 507.

The trips over the South Eastern and Chatham section have been distinguished by what were to me some very notable features, especially as regards the return journey over the Kent Coast line. Briefly, after some years unsuccessful in the quest —granted that I have made most of my attempts on Fridays, when the train concerned has been very heavily loaded—I have obtained a journey on the 3.15 p.m. down 92-min. express from Victoria to

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Margate on which time was not only kept, but that despite two p.w.r. checks and a dead stand for signals *en route*. And then, as if that were not sufficiently outstanding an achievement, in returning on

SOUTHERN RLY. (S.E. & C. SECTION)

3.15 p.m. VICTORIA–MARGATE. Re-built 4-4-0 Engine No. 502. Driver: H. Williams, Margate Shed. Load: 40 axles; 259 tons tare; 285 tons full.

Distance.	Stations.	Schedule.	Actual.	Speeds *
Miles.		Min.	m. s.	m.p.h.
0·0	Victoria	0	0 00	—
0·9	Battersea Pier Jc.	—	2 40	—
			p.w.r.	25
3·2	Brixton	7	6 55	—
4·0	Herne Hill ¶ ..	8	8 15	—
5·7	Sydenham Hill ..	—	11 40	29
8·7	Beckenham Jc. ..	15	15 40	61
10·0	Shortlands ..	—	17 15	48½
10·8	Bromley	—	18 10	57½
11·9	Bickley	—	19 35	—
12·6	Bickley Jc. ..	20	20 35	39½
13·3	St. Mary Cray Jc.	21	21 30	—
14·8	St. Mary Cray ..	—	23 10	64½
17·6	Swanley	27	26 20	49
20·5	Farningham Road	—	29 05	74
22·6	Fawkham Jc. ..	—	31 10	55
23·3	Fawkham ..	—	32 00	60
25 9	Meopham	—	35 20	40
			p.w.r.	35
26·8	Sole St. ¶	37	36 50	—
	Cuxton Road Box¶	42	41 35	50
32·9	‖ Rochester Bridge {	pass	44 55	—
		45	45 20	—
33·7	Rochester.. ..	—	47 55	—
34·3	Chatham	48	48 55	35
35·9	Gillingham ..	—	51 50	33
38·9	Rainham	—	55 40	57½
41·6	Newington ..	—	58 25	62½
44·7	Sittingbourne ..	60	61 20	74
48·0	Teynham	—	64 10	54
52·0	Faversham ¶ ..	68	68 20	30†
58·6	Whitstable ..	—	76 35	62½
62·7	Herne Bay ..	81	80 30	48½
70·7	Birchington ..	—	88 20	72½
72·3	Westgate	—	90 10	60
73·9	Margate	92	92 30	—

* Max. and min. speed, by chronograph, at *or near* stations shown.
† Reduced from 64 m.p.h.
¶ Service slacks. ‖ Signal stop.

the 5.20 p.m. 98-min. express to Victoria, as our engine was beginning to run slightly hot at Sittingbourne, and the driver thought it inadvisable to proceed much further, he stopped at Newington, exchanged his superheated 4-4-0 for a Wainwright 0-6-0 goods which was shunted there with its train, unprepared for anything remotely approaching express running, and with this inadequate mount actually succeeded in keeping the sectional times of the express from Chatham to

SOUTHERN RLY. (S.E. & C. SECTION).

5.20 p.m. MARGATE–VICTORIA. 0-6-0 Engine, No. 581. Driver: V. Ovenden, Margate Shed. Load: 38 axles; 241 tons tare, 265 tons full.

Distance.	Stations.	Schedule.	Actual.	Speeds †
Miles.		min.	m. s.	m.p.h.
0·0	Newington ..	—	0·00	—
2·7	Rainham	—	5 50	42
5·7	Gillingham ..	—	10 00	47
7·3	Chatham ¶ ..	12	12 00	20
7·9	Rochester ¶ ..	—	13 20	—
8 7	Rochester Bridge ¶	15	15 05	—
	Cuxton Road Box	—	19 00	34½
14·8	Sole Street ..	27	27 45	25½
15·7	Meopham	—	29 20	—
18·3	Fawkham ..	—	32 40	—
19·0	Fawkham Jc. ..	—	33 30	59
21·1	Farningham Road	—	35 45	64
24·0	Swanley	37	39 20	41
26·8	St. Mary Cray ..	—	42 40	60
28·3	St. Mary Cray Jc.	43	44 35	42½
29·0	Bickley Jc. ..	44	45 30	—
29·7	Bickley	45	46 30	57
31·6	Shortlands ..	—	48 40	41
32·9	Beckenham Jc. ..	50	50 35	51
35 9	Sydenham Hill ..	—	54 45	36½
37·6	Herne Hill ¶ ..	58	57 25	33
38·4	Brixton	59	58 50	—
			p.w.r.	30
40·7	Battersea Pier Jc.	—	62 45	—
41·6	Victoria	65	65 10	—

† Max. and min. speeds, by chronograph, at *or near* stations shown.
¶ Service slacks.

London—one of the most masterly, not to say plucky, feats of locomotive driving that it has ever been my pleasure to witness and to record.

Nothing short of complete tabulation in the manner accompanying would do these two remarkable journeys justice. One hears varied accounts of the capabilities of the rebuilt and superheated D's and E's, which are the type chiefly employed on the Kent Coast expresses and also on the boat trains (track restrictions preventing the employment of the large Wainwright superheated 4-4-0's as yet over any portion of the Chatham route), but for myself I must say that the majority

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of the journeys I have enjoyed behind them have been in every way satisfactory, and that I have noted little, if any, of the slipping trouble to which they are alleged to be addicted. Certainly the times on this down journey, for the achievement of which the capable work of Driver H. Williams, of Margate shed, was responsible, left nothing to be desired. Despite the Clapham p.w.r. check, the further one at Sole Street, and a restriction of speed to round about 50 m.p.h. all the way down Sole Street bank, we stopped at Rochester Bridge (by signal) dead on schedule time, Margate, with a steeply rising start at 1 in 132 to beyond Gillingham, and a most cautious slack to 30 m.p.h. at Faversham, were run in 47 min. 10 sec., which represents a start-to-stop average speed of 52·2 m.p.h.

Coming back we had done excellently with rebuilt 4-4-0 No. 545 as far as Faversham, attaining 66 m.p.h. at Birchington, and 71½ beyond Herne Bay, with a minimum of 47½ between the two; Birchington had been passed in 6 min. 35 sec., Herne Bay in 14 min. 55 sec., Whitstable in 18¼ min., and Faversham, 21·9 miles, in 25½

Photo.] **LONDON MIDLAND AND SCOTTISH RAILWAY.** [*F. E. Mackay.*

Down Liverpool express near Wembley. 4–6–0 four-cylinder "Claughton" locomotive, No. 162.

to which we had adhered closely all the way, and with all these hindrances we had won back to schedule on passing Faversham. The free running of the engine at high speeds was noticeable, such maxima as 74 m.p.h. at Farningham Road and near Teynham being unusual, while 72½ was reached between Herne Bay and Birchington. Equally good was the uphill work, such minima as 29 and 39½ m.p.h. on the 1 in 101 and 95 stretches up to Penge Tunnel and Bickley Junction, or 40 on Fawkham Bank (4 miles mostly at 1 in 100), or 54 on the rise between Teynham and Faversham (finishing with a mile at 1 in 132), all being worthy of comment. It may be remarked that the 41 miles from Rochester Bridge to

min. But as we descended to Teynham it was clear that speed was falling off, and two "crows" from the engine as we passed Sittingbourne were evidently intended as a summons for help from Gillingham locomotive depôt. Speed had now dropped considerably, and Driver Ovenden, spying in the up siding at Newington, chimney towards London, a 0-6-0 goods with steam up, and unwilling to take the risk of proceeding further, stopped at this wayside station, in just over 40 min. from Margate. In 6¾ min. the trains had exchanged engines and the engines had exchanged drivers, and we were again under way. I still expected that we should stop at Gillingham or Chatham in order, if possible, to secure a more suitable type of

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engine, but Driver Ovenden, having taken the measure of his new steed during these few miles, determined to make the best of it, and so we went right ahead.

To show how we maintained sectional time, I have started the schedule times in the table level with our time from the Newington start. Only 40 sec. were lost on the ascent of Sole Street bank (5 miles almost entirely at 1 in 100), and only 95 sec. on the fast running stretch from there to Swanley, the engine developing a simply extraordinary capacity for speed, as we accelerated—with 5 ft. wheels—to 64 m.p.h. at Farningham Road! After Swanley we were up again to 60 m.p.h.

On the Folkestone trains I have not been so successful as in previous years, so far as time-keeping is concerned, but this is chiefly because I tried the 80-minute trains, out of curiosity, at times when they were very heavily loaded. It is tolerably clear that loads much in excess of 250 tons put adherence to schedule, on these very fast timings, even beyond the powers of the large superheated 4-4-0 engines. From the annexed table, it will be seen that we went out of Charing Cross on the 1 p.m. express, on the Friday before August Bank Holiday, with a train of no less than 47 axles, packed with passengers—so much so, indeed, that I

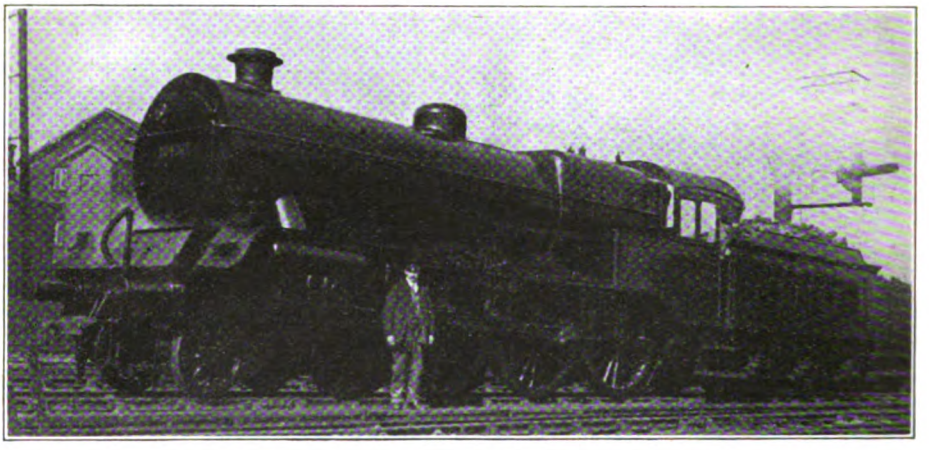

Photo.] LONDON MIDLAND AND SCOTTISH RAILWAY. [*R. Hogan.*

Four-cylinder 4-6-0 locomotive, No. 10447.
Painted, lined and re-numbered according to new L.M.S. standards.

at St. Mary Cray, and gained time steadily until we were 40 sec. on the right side of schedule at Herne Hill; this advantage we should have maintained but for the Clapham p.w.r. check. But in any case, to bring his train into Victoria only 14 min. late, after such a casualty as the loss of his own engine by heating, and the subsequent disability of exchanging for what would normally be considered a totally unsuitable type of engine for the work, was a feat which reflected tremendous credit on Driver Ovenden and his fireman, and I am sure that most of my readers would have shared with me, had they been present, in the congratulations I offered to him at the end of the run. Personally, I would not have missed the experience for anything.

doubt if my allowance of 30 tons in respect of the latter is adequate, in a train of almost exclusively non-corridor stock. To my mind, it is praiseworthy that no more than 3 min. were lost on schedule time.

We reached 53½ m.p.h. at New Cross, passed Hither Green at 47½ m.p.h. and fell to 31½ at Elmstead Tunnel, recovered to 38½ m.p.h. at Chislehurst and 43½ beyond Orpington, after which the minimum at Knockholt Summit was 34½ m.p.h. A maximum of only 65 m.p.h. was reached at Dunton Green, but after falling to 48 m.p.h. at Sevenoaks Tunnel, we blazed away in great style down to Tonbridge, maintaining 77½ m.p.h. for a full 1¼ miles before slackening round the curve to 45 m.p.h. Between Tonbridge

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and Ashford, speed varied from 65 m.p.h. at Paddock Wood to 59 beyond Marden, 66 beyond Staplehurst, 57 beyond Headcorn, 61½ at Pluckley and 54 on the rise immediately following, and 62½ m.p.h. at Ashford, where by slipping we shed 85 tons of our train, and left 255 tons to go tons behind the tender, was no mean feat.

With one of the morning Folkestone boat trains, carrying Flushing and Boulogne passengers, rebuilt 4-4-0 No. 160 did some very satisfactory work. The tare load was some 60 tons below the 290

SOUTHERN RAILWAY (S E. & C. SECTION) CHARING CROSS—FOLKESTONE.

Schedule.	775 47 310 340	Schedule.	160 33 231 245	Distance.	Engine No. Load (axles). ,, (tons tare). ,, (tons full).	Distance.	Schedule.	761 36 255 275	777 44 312 340
Min.	M. S.	Min.	M. S.	Miles.		Miles.	Min.	M. S.	M. S.
0	0·00	v o.	v 0·00	0·0	Charing Cross.. ..	70·0	80	81·50	91·00
									sigs.
5	4 55	w –	w 4 45	1·8	London Bridge ¶ ..	68·2	75	77 40	85 05
			p.w.r.						*sigs.*
9	9 20	H 9 ¶	H 8 25	4·9	New Cross	65·1	71	73 50	79 25
			sigs.						
12	12 10	B 19	B 16 25	7·1	Hither Green ..	62·9	68	71 20	76 45
18	18 50	J 26¶	J 22 40	11·2	Chislehurst	58·8	64½	67 55	73 05
—	pass	pass	* 24 40	12·2	Orpington Junction ..	57·8	—	pass	pass
	20 35	28	24 55					67 05	72 10
21	22 50	31	28 35	§13·8	Orpington	56·2	62	65 40	70 40
—	27 05	36	33 40	16·5	Knockholt	53·5	59	62 55	67 45
—	31 45	—	38 35	20·5	Dunton Green ..	49·5	—	57 45	62 15
31	33 20	43	40 15	22·0	Sevenoaks	48·0	53	56 05	60 25
—	38 10	—	45 10	26·9	Hildenborough ..	43·1	—	47 40	50 35
			p.w.r.						
38½	40 40	51½	48 40	29·5	Tonbridge¶	40·5	41	43 30	45 55
44½	46 40	58	54 25	34·8	Paddock Wood ..	35·2	36	38 00	39 55
—	51 00	—	58 40	39·4	Marden	30·6	—	33 40	35 15
—	53 35	65	61 05	41·9	Staplehurst	28·1	—	31 10	32 35
54	56 45	—	64 25	45·2	Headcorn	24·8	—	28 00	29 15
—	62 10	—	69 55	50·5	Pluckley	19·5	—	23 05	24 10
			p.w.r.						
65	68 05	80	77 25	56·1	Ashford	13·9	16	17 35	18 25
—	72 35	—	82 15	60·4	Smeeth	9·6	—	13 35	14 10
—	76 50	—	86 35	64·1	Westenhanger ..	5·9	—	9 40	10 10
75	78 20	91	88 00	65·4	Sandling Jc.	4·6	7	8 00	8 35
—	81 55	—	92 00	69·3	Shorncliffe	0·7	—	2 10	2 25
80	83 00	—	92 50	70·0	Folkestone Central ..	0·0	0	0 00	0 00
—	—	98	‖95 45	‖71·1	Folkestone Junction ..	—	—	--	—
80	83	98	‖89	‖70·0	Net times (min.)	70·0	80	81¼	88

v Victoria ; w Wandsworth Road, 1·9 miles ; H Herne Hill, 4·0 miles ; B Beckenham Jc., 8·7 miles ; J Bickley Junction, 12·6 miles. § Add 1·1 miles to this and all succeeding distances from Victoria. ‖ 72·2 miles from Victoria. ¶ Severe service slacks, up and down journeys. * Signal stop.

forward. The work with this reduced load was the only really disappointing feature of the trip, as we fell quite poorly to 49½ m.p.h. at Westenhanger, and only attained 68 m.p.h. at Cheriton, so regaining none of the lost three minutes. For all that, to cover the 39·5 miles from Knockholt to Ashford, Tonbridge slack included, in 41 min. with a train of 340 tons allowed these engines, but three p.w.r. checks, a signal check and a signal stop at Orpington Junction did not prevent us from gaining 2¼ min. on schedule, and that despite a most leisurely descent to and stop in the siding at Folkestone Junction. At Sydenham Hill the lowest rate was 24½ m.p.h., and at Bickley 29½ ; after the Orpington stop we accelerated to

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30½ m.p.h. at Knockholt summit. Descending to Tonbridge we touched 60 m.p.h. at Dunton Green, fell to 49½ at Sevenoaks Tunnel, and reached 70½ before the Hildenborough p.w.r. check. Then, once away from Tonbridge, we went quite gaily, reaching 67 m.p.h. beyond both Paddock Wood and Marden, with an intervening minimum of 61½, after which we eased somewhat, and last of all there came the Pluckley p.w.r. check. Nothing noteworthy was done after this, time being so well in hand; except that a further 1½ min. were gained by a smart reversal at Folkestone Junction, and descent to the Harbour. Between Knockholt and Ashford on this trip the running was practically up to the 80-min. Folkestone standard, and it is worthy of note that No. 160 gained 9 min. net on her schedule.

The two up journeys, by the 11 a.m. and 5.10 p.m. trains, were both heavily loaded, for this booking, and both showed loss of time, although No. 761 with 275 tons dropped less than 2 min. Most of this would have been wiped out with a more energetic descent from Westenhanger to Ashford, but there was practically no loss of time from there to Charing Cross. No. 777, however, lost time badly—worse, indeed, than even such a load as this, as well as a violent south-westerly wind, seemed to warrant. Accelerations up the rising grades from Folkestone to Sandling on the two trips were to 46½ and 44½ m.p.h. respectively, and the maxima at Ashford, reached after very slow subsequent acceleration, were 68 and 65 m.p.h. After that the speeds with the lighter train were 60 m.p.h. before and 66 at Pluckley, 64 before and 68 at Headcorn, 60 at Marden, 66 at Paddock Wood and 54 on the rise before Tonbridge; corresponding figures with the heavier express were 57½, 64, 60½, 65, 57, 62½ and 50½ m.p.h. respectively.

After slacking to just over 30 m.p.h. on both runs through Tonbridge, we attained 40½ and 37 m.p.h., fell to 34 and 27 m.p.h. on the long 1 in 122 up to Sevenoaks Tunnel, and then recovered to 36½ and 32½ m.p.h. on the 2 miles at 1 in 140 through the tunnel; such a recovery was very satisfactory in both cases, and it certainly constituted the most notable feature of No. 777's work. We touched 60½ and 57½ m.p.h. at Dunton Green, and went up to Knockholt at minima of 40 and 36½ m.p.h. Then No. 761 undertook a most enlivening sprint to town, reaching 71½ m.p.h. at Orpington, 74 at Chislehurst and 76½ at Grove Park, with slightly lower intermediate fluctuations. No. 777 was content with 66, 68 and 70½ m.p.h. So No. 761 regained 2 min. from Knockholt to Charing Cross even on a booking which demands an average speed of 70 m.p.h. from Chislehurst to Hither Green, and that with full observance of the necessary slacks at Park's Bridge, St. John's, New Cross and London Bridge. For details of time-keeping runs on these trains with lighter loads and details also of the gradients readers should refer to the September issue of 1922.

A return journey to Hastings embodied little that is worthy of description. Going down on the 5.4 p.m. from Cannon St., No. 780, with a 40-axle train of 300 tons, got a bad road to Tonbridge from the preceding 5 p.m. special Friday 80-minute train to Folkestone, and so lost 2 min. on the 51-min. allowance to Tunbridge Wells; by poor subsequent running, especially downhill, the 34-min. schedule on to West St. Leonard's was only just maintained. Coming back, No. 772 had a featherweight train of 190 tons, and ran the 23·2 miles from Crowhurst to Tunbridge Wells in ¾-min. less than the 32 min. allowed, passing Robertsbridge, 8 miles, in 10½ min., at 71½ m.p.h., and Wadhurst, 18·3 miles, at the top of a 6-mile bank at 1 in 100–132, in 24 min. 20 sec., at 32 m.p.h. From Tunbridge Wells we covered the 32·6 miles to London Bridge in 50 min. (allowed 51 min.), despite p.w.r. and signal checks before Tonbridge costing over 2 min., and a very sluggish descent from Knockholt.

In conclusion I come to the table of runs illustrative of the work performed on the Great Eastern Yarmouth service during the past summer. The reversion to pre-war times over the severe grades of the East Suffolk line, and to-day with heavy corridor trains of ten, eleven and even twelve vehicles, weighing up to 350 tons in total weight, aroused in me a very keen desire to see to what extent time-keeping is possible under such conditions, and the little spare time I have had this summer to devote to performance over this section of the London and North

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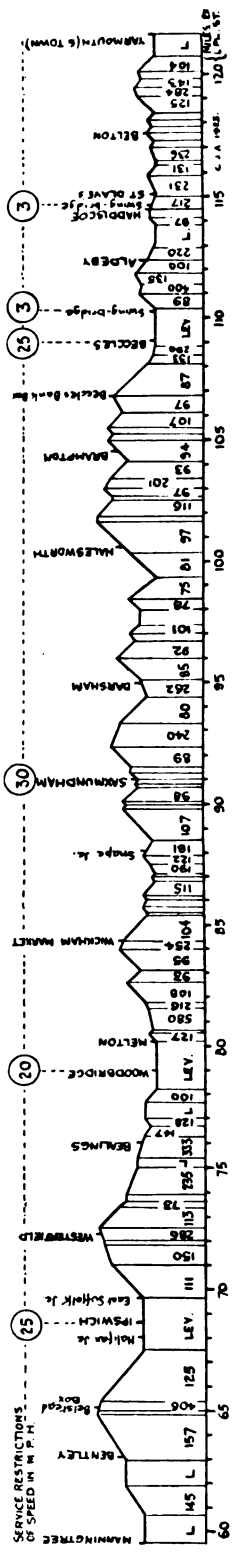
Eastern system has therefore been concentrated on these expresses. As it is quite impracticable to describe in any way that can readily be grasped the gradients referred to, I have prepared the annexed profile of the route from Manningtree on to Yarmouth, which, taken in conjunction with that reproduced in the October issue of last year, from Liverpool Street to Parkeston Quay, gives the whole of the London-Yarmouth course. It is hardly necessary to emphasize the enhancement of running difficulties occasioned by the service slacks; in addition to those at Stratford, Chelmsford and Colchester, readers should note how the Ipswich, Woodbridge and Beccles slacks leave drivers with no impetus wherewith to surmount steep adjacent ascents in both directions, and then, to crown all, there are the slacks to walking pace in order to pick up and set down the pilotman on both sides of the swing-bridges north of Beccles and Haddiscoe, worse in their effect on the running of a heavy express even than two brief station stops might be. The table reveals how insufficient is the pre-war time allowance to the non-stop trains between Beccles and Yarmouth, especially in the up direction, when these difficulties have to be negotiated with present-day loads. The Saxmundham restriction seems somewhat excessively severe, and the actual slacks made on each run were very slight, although the travelling of the trains through the station was perfectly smooth.

My only journey on the 12.30 p.m. down express, which is allowed 3 min. more to Ipswich than the corresponding train before the war, for time-table reasons only, but unaltered times beyond Ipswich, was so badly delayed by the 12.25 p.m. Cromer express (taking out 13 bogies to our 10), as well as by two p.w.r. checks, that we passed Ipswich 9 min. late, and had no chance of free running up to that point. Possibly arrangements could be made in another summer to work the Yarmouth train ahead of the Cromer, as it is almost invariably the lighter of the two, and the margin between them is very small. From Ipswich we kept time to Beccles, but another minute was dropped on the swing-bridge section, making 10 min. loss to Yarmouth; we should probably have kept end-to-end time without difficulty, however, given a clear road, as it would not be hard to cut the 85-min. allowance to Ipswich. We only fell from 44½ to 40 m.p.h. up Westerfield bank, and accelerated to 46 at the summit; speed did not exceed 64½ m.p.h. on Bealings bank, and then, after Woodbridge slack, we accelerated to 55½ m. p. h. beyond Melton, climbed to Wickham Market at a lowest speed of exactly 50, and touched 67 near Snape Junction; through Saxmundham we slacked to 45 m.p.h., and then went up the subsequent 1 in 89 at a minimum of 36½ m.p.h.; Darsham "dip" brought us up to 64½ m.p.h. and down again to 47; and a maximum of 66 m.p.h. before Halesworth preceded a lowest rate of 42½ up the 2 miles at 1 in 81–97 past that station (excellent work, this last); 66 m.p.h. was reached down Beccles bank before we entered the final troublous length through and beyond that station.

The second journey was on the far more easily timed 9.55 a.m. down. Once again we got a bad start by



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signal delays, and it was not until we were well past the Ingatestone p.w.r. check, and the service slack at Chelmsford (most carefully observed), that we began to overtake our arrears. To such effect did we do so, however, that, despite the p.w.r. slack at Colchester Junction, right at the bottom of the sharp rise to Parson's Heath, we gained 5¼ min. on schedule from Witham to Ipswich. Witham was passed at 64½ m.p.h., and we mounted the rising grades to Hill House, concluding with 2 miles at 1 in 230-214 from Kelvedon, at a minimum of 50; then we touched to his credit in all from London to Yarmouth.

The first part of the third down journey was made on the 9.50 a.m. down Cromer express, and to me was of great interest in that it enabled me to observe, for the first time, the running of one of the new "1780" class of "Super-Claud" 4-4-0 engines, with quite a substantial train of 12 corridor cars. The performance was more than up to expectations. After yet a third bad start, we got clear away from Stratford, and proceeded to gain 1½ min. from there up to Shenfield—a most unusual feat, and

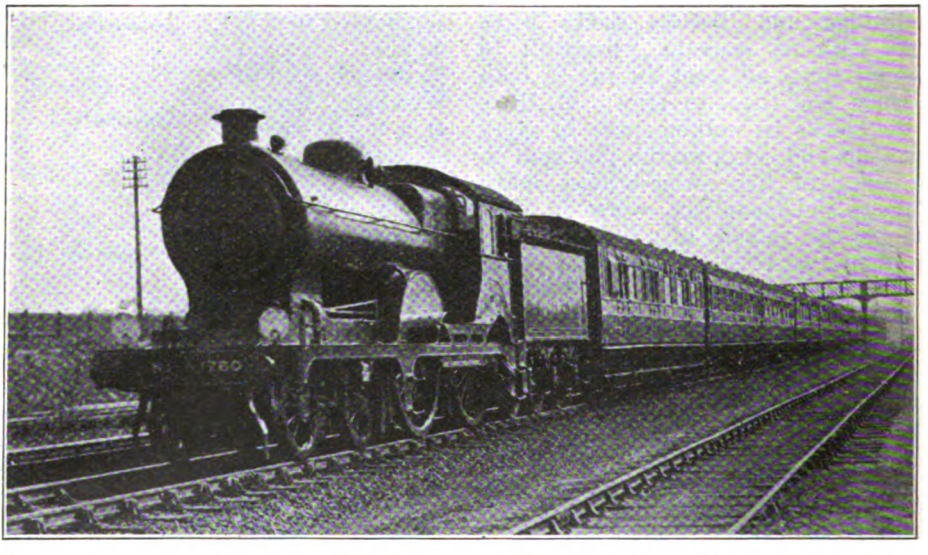

Photo.] LONDON AND NORTH EASTERN RAILWAY. [*F. E. Mackay.*

Up Clacton and Walton centre-corridor express.
Great Eastern New 4–4–0 ("Super-Claud" type), No. 1780.

64½ m.p.h. at Mark's Tey "dip" and 69 before slacking for Colchester. After that we passed Manningtree at 68 m.p.h., and achieved the excellent feat of mounting Bentley bank, with its 3 miles at 1 in 145-157, at a minimum of 51 m.p.h., subsequently touching 66 m.p.h. before slowing for Halifax Junction. To Ipswich the net time certainly did not exceed 83 min.; after that the driver was content practically to adhere to schedule time on to Beccles, to which our net time was 137 min. Adding to this 5 min. more gained on the extraordinarily generous allowance of 28 min. from Beccles to Yarmouth (now with 6 bogies only), the driver had 14 min. one which shows that No. 1780 could have passed Shenfield without difficulty in 28 min., given a clear road. Speed increased, on gradually rising grades, from 52½ m.p.h. at Ilford to 57 at Harold Wood, whence we fell to 29 m.p.h. on Brentwood bank. We got up to 65 m.p.h. before the Ingatestone "caution," and 61½ afterwards; then we suffered slight delay through brakes leaking on, but were going at 66 m.p.h. when we passed Witham, only fell to 52½ m.p.h. on the rise from Kelvedon, and touched 67 before Colchester, which we passed in a net time of under 61 min. The recovery from the p.w.r. check was very fine, and with a most

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spirited dash past Manningtree at 74 m.p.h., an ascent to Belstead at a minimum of 50, and a top speed of 70½ before Ipswich troughs, we stopped inside the smart 86-min. schedule, notwithstanding a signal check as we entered the station. Net time from London on this first-class trip was nothing over 79 min.—a gain of 7 min., and a demonstration that the new engines yield little to the 4-6-0's in their powers of haulage at speed.

At Ipswich I changed into the 9.55 a.m. down, which had an additional 5-min. stop there in the latter part of September, without increase of overall journey time. No. 1562 brought the train in some 3 min. early, although she must have been delayed by us to Stratford, and had also encountered the same two p.w.r. checks; she then proceeded to gain a further 4 min. (net) from Ipswich to Beccles, and 4 min. from there to Yarmouth, so that the two engines were responsible for 15 min. gain from London on this trip also. There was nothing of special note in the running, however, as even the additional stop at Ipswich leaves the timing still easy by comparison with that of the 12.30 p.m. down, and the load was identical. We only bettered the running in the first column on the falling grades, in particular with a maximum of 69 m.p.h. before Woodbridge slack.

The two up runs on the 150-min. 1.35 p.m. up express were both, in my judgment, very good, even though there was a loss of 4 min. to engine on the second occasion. The working book limits the load on this train to 44 axles, so that we had a coach in excess, whereas on the first trip the load was just under the specified maximum. It will first be noticed that even with the 285-ton train there was a loss of nearly 3¾ min. to Beccles, but so excellently was No. 1562 driven after that that not only was this deficiency wiped out when we passed Ipswich, but a total of 5½ min. was gained from Beccles to Witham. The fastest part of her journey was over the 20·4 miles from Halesworth to Melton, which were covered in 19 min. 30 sec., at an average of 63 m.p.h. over this steeply-graded switchback. No. 1538, with the 350-ton train, dropped 6¼ min. to Saxmundham, but from there we slightly bettered time to Shenfield, and then made an unusually fast run into town. Minimum speeds at the top of Beccles bank were 28 and 25½ m.p.h., and on the sharp undulations to Brampton we got up to 57½ and 55½ m.p.h., before reaching 75 and 72½ m.p.h. on Halesworth bank. The other side of the Halesworth "dip" merely brought us down to 65 and 55½ m.p.h., and the summit of the rise before Saxmundham to 54 and 48 m.p.h.; then at Snape Junction we were up again to 71½ and 68 m.p.h. Topping Wickham Market at 51 and 45 m.p.h., our maxima before Woodbridge slack were 71½ and 62½ m.p.h. (the latter was a rather poor figure on the part of No. 1538), and then we recovered from the slack up rising grades to the notable speeds of 53 and 47½ m.p.h. before breasting Westerfield Summit at 45 (a fine achievement) and 37½ m.p.h. Westerfield bank, taken very moderately, brought us up to 68 and 66 m.p.h. before the Ipswich slack.

The steep ascent to Belstead was commenced at 47½ and 42 m.p.h., and completed at 36½ and 32 m.p.h., after which we touched 65 and 68 m.p.h. at Manningtree before falling to 41½ and 40½ m.p.h. on Dedham bank. No. 1562 was now travelling under easy steam, having time in hand, and went very gently down to Colchester, whereas No. 1538 touched 66 an hour before the slack. Lowest speeds on Lexden bank were 43 and 39½ m.p.h., and we passed Kelvedon at 66 and 64½ m.p.h., mounting the brief ascent after Witham at minima of 42 and 41½ m.p.h. The work of No. 1538 from Witham to Chelmsford, where we lost 1½ min. of regained time, was the poorest length of her journey, whereas the recovery from Chelmsford up to Ingrave, with a recovery to 55 m.p.h. beyond Ingatestone, and a minimum rate of 43½ at Ingrave, was the best. Then followed a fine finish into London, with a top speed of 76½ m.p.h. at Harold Wood, tailing off gradually to 70½ at Romford, 67 at Chadwell Heath and 64 at Ilford; in fact, the 12·4 miles from Brentwood to Forest Gate Junction were covered at an average of 67 m.p.h. But No. 1562 had a p.w.r. check at Ingatestone, and then, after touching 75 m.p.h. at Harold Wood, and passing Chadwell Heath on time, we were dead stopped at Forest Gate Junction for signals, on account of an empty carriage train which

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Schedule.	1555 4-6-0 40 268 280	Schedule.	1502 4-6-0 40 266 280	Schedule.	*1780 *4-4-0 *48 *320 *330	Distance.	Engine No. ,, Type. Load (axles). ,, (tons tare). ,, (tons full).	Distance.	Schedule.	1562 4-6-0 40 268 285	1538 4-6-0 48 324 350	Schedule.	1555 4-6-0 52 344 370
min.	m. s.	min.	m. s.	min.	m. s.	miles.		miles.	min.	m. s.	m. s.	min.	m. s.
0	0 00	0	0 00	0	0 00	0·0	Liverpool St.	121·8	150	154 00	154 00	§148	§147 30
	sigs.		*sigs.*		*sigs.*								*sigs.*
8	9 45	8	12 00	8	11 20	4·0	Stratford ¶	117 8	142	146 15	146 05	139	135 25
										sigs.			*sigs.*
—	14 50	—	17 00	—	15 55	7·3	Ilford	114·5	—	137 25	142 25	—	131 00
	sigs.												
16	18 45	16	20 10	16	18 55	10·0	Chadwell Heath	111·8	135	134 45	140 00	132	128 30
	sigs.		*sigs.*										
—	21 55	—	23 00	—	21 35	12·4	Romford	109·4	—	132 35	137 50	—	126 20
	sigs.												
—	30 35	—	31 10	—	28 30	18·2	Brentwood	103·6	—	127 25	132 50	—	121 00
—	32 55	—	33 10	—	30 35	19·3	Ingrave Summit Box	102·5	—	126 00	131 30	—	119 30
30	34 15	30	34 30	30	31 55	20·2	Shenfield	101·6	125	124 40	130 20	120	118 10
	p.w.r.		*p.w.r.*		*p.w.r.*					*p.w.r.*			
—	38 20	—	38 45	—	35 35	23·6	Ingatestone	98·2	—	119 15	126 15	—	113 45
40	46 10	41	46 40	40	42 40	29·7	Chelmsford ¶	92·1	114	112 10	119 10	108	105 40
—	53 35	—	53 55	—	49 45	35·9	Hatfield Peverel	85·9	—	105 35	112 10	—	99 05
51	56 35	51	56 40	50	52 30	38·6	Witham	83·2	104	102 10	107 45	97	96 00
—	60 25	—	60 30	—	56 05	42·3	Kelvedon	79·5	—	98·25	104 10	—	92 20
—	65 50	—	65 15	—	60 50	46·6	Mark's Tey	75·2	—	93 45	99 40	—	86 45
66	71 30	67	70 20	65	65 55	51·7	Colchester ¶	70·1	89	87 40	93 45	82	79 45
	p.w.r.		*p.w.r.*		*p.w.r.*								
—	78 35	—	78 00	—	71 50	56·0	Ardleigh	65·8	—	82 50	89 00	—	74 30
	sigs.												
75	82 30	78	81 35	75	75 15	59·5	Manningtree	62·3	79	78 35	84 45	72	69 45
—	87 40	—	85 15	—	78 45	63·2	Bentley	58·6	—	74 55	81 10	—	65 50
—	90 05	—	87 30	—	81 05	65·2	Belstead Box	56·6	—	72 20	78 25	—	63 00
					sigs.								
				86	85 40	}							
85	94 05	91	91 25	0	0 00	68·7	Ipswich ¶	53·1	67	67 00	72 25	57	56 55
—	95 35	—	92 40	—	2 25	69·6	E. Suffolk Junction	52·2	—	65 55	71 15	—	55 25
—	99 40	—	97 30	—	7 45	72·3	Westerfield	49·5	—	63 10	68 10	—	52 20
—	103 40	—	102 00	—	12 20	76·0	Bealings	45·8	—	58 40	63 00	—	46 50
—	107 00	—	105 10	—	15 15	79·0	Woodbridge ¶	42·8	—	54 35	58 35	—	41 55
—	108 45	—	107 15	—	17 00	80·3	Melton	41·5	—	53 10	57 05	—	40 20
—	113 40	—	112 50	—	22 15	84·5	Wickham Market	37·3	—	49 10	52 30	—	35 45

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| | | |

Great Eastern metals, just touching 80½ before we slacked to stop at Wickford, in 39¾ min., or 38¾ min. net from Liverpool Street. Allowance for the 29 miles is 39 min. Restarting with 155 tons up the ¾-mile at 1 in 100 to Fanton, No. 1866 attained 55 m.p.h. on the corresponding ¾-mile descent which follows, and then went up the 2½ miles at 1 in 100 past Rayleigh at a minimum of 42½ m.p.h. The descent past Hockley to Rochford produced a top speed of 77½ m.p.h.—77½ and 80½ in one Southend journey were indeed exhilarating fare—and we stopped at Rochford, 9·7 miles, in the very smart time of 12 min. 25 sec. The short run of 2·2 miles to Prittlewell took 4 min. 5 sec., and the final 0·6 miles into Southend 2 min. 20 sec., making a total with stops of 60 min. 55 sec., or an even hour net, from London. This is evidently a train worth watching, as the schedule leaves nothing to spare anywhere; only a single minute, indeed, is allowed to divide the train at Wickford. These Southend expresses are now being worked to a large extent by the new "Super-Clauds" of the "1780" type, whose increased powers of haulage should be of considerable assistance on such tight timings.

POST-EARTHQUAKE TRANSPORTATION IN JAPAN.

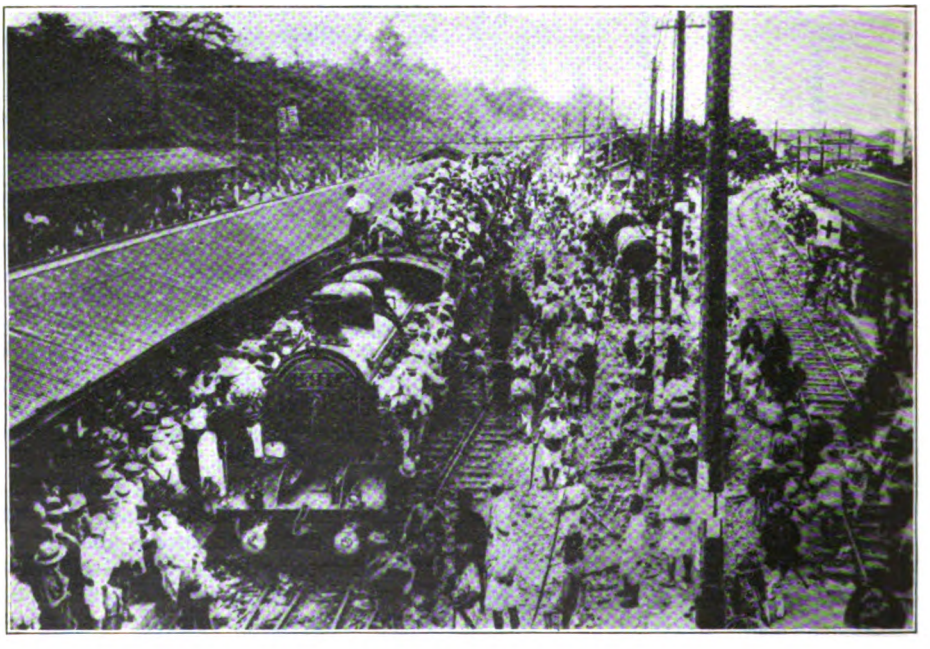

Photo.] SCENE AT A TOKYO STATION AFTER THE EARTHQUAKE. [*Topical.*

Transportation in Japan following the recent earthquake there was seriously disorganised. After the conflagration and flames had subsided and emergency transportation had been established, thousands of refugees sought conveyance from the devastated area. The above illustration shows a train about to leave one of the stations in Tokyo, and the crowding of the people in their anxiety to reach some more fortunate locality. Every available inch of train space being occupied, the refugees piled themselves aboard the cab roof, as also along the sides of the engine boiler.

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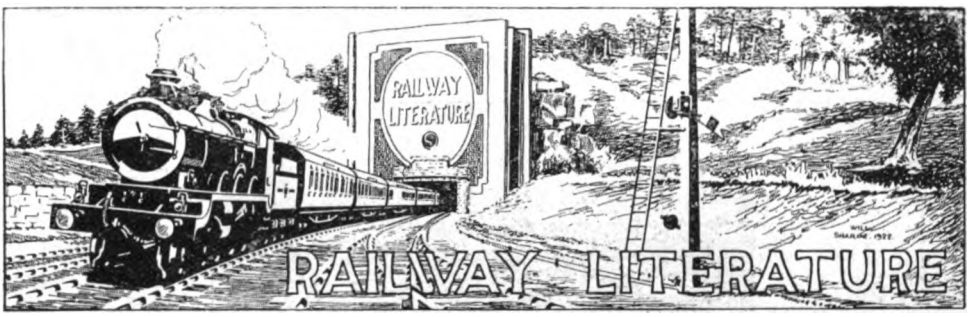

ALL ABOUT OUR BRITISH RAILWAYS. By G. G. Jackson. [London: T. C. & E. C. Jacks, Ltd. Cloth, 6 in. × 8½ in. × 1½ in. 288 pages. 120 illustrations. Price 6s. net.]

This is a bright and breezy book, with no smell of the midnight oil about it, in spite of the author's freely admitted indebtedness to printed sources of information, including THE RAILWAY MAGAZINE and the RAILWAY YEAR BOOK. In the opening chapters the genesis of our railways and the story of their early days is re-told in a pleasant manner that makes the reading agreeable even to those who are thoroughly familiar with the history recapitulated. To the budding railwayist a chapter devoted to the livery of our railways will make a strong appeal, while the author's suggestions in regard to colour schemes for the new groups will set many to work on alternative schemes of their own.

In compiling his book the author has been thoroughly comprehensive in his survey of the railway world. He deals with civil and mechanical railway engineering as well as railway operation and he has not hesitated to give the why and wherefore of many controversial matters, such as the passing of the single-driver locomotive and the continuance in British railway service of the small-sized goods wagon.

As is customary in books of this character much space is devoted to the steam locomotive. Mr. Jackson writes in appreciative terms of the iron-horse and expresses sympathetic regard for the more menial types as well as admiration for main-line passenger "flyers." "When you see," he writes, "the humble goods engine give her a hand wave, for she represents the backbone of railway practice."

Electric traction and its coming from a railwayist's point of view is considered and so likewise is the business side of electrical development. Several chapters are devoted to railway features that are famous, biggest, longest, newest and so forth—just the kind of information for which there seems to be, among the young particularly, an insatiable demand. The intimate personal touches introduced by Mr. Jackson go far to make the book a "live" one and do much to further his avowed aim "to write in a chatty fashion of our railways, avoiding unnecessary technicalities, yet striving to teach something of the great work which our railways perform."

RAILWAY SIGNALLING: MECHANICAL. By Fras. Raynar Wilson. [Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, London, W.C.2. Price 2s. 6d. net.]

This is a companion volume to that recently issued in the same series on "Railway Signalling: Automatic." The author is an assistant engineer of the Victorian Government Railways, and a son of Mr. H. Raynar Wilson, who contributes a foreword. Within the scope of 109 pages, and with the aid of 75 line or half-tone illustrations, the principal factors in mechanical railway signalling are very completely covered. After explaining the block system, with reference to lock and block, permissive block and single line working, the author discusses signalling lay-out, interlocking and safety points, the arrangement and equipment of signal boxes and methods of interlocking, and types of locking frames. Further chapters deal with signal fittings, point lay-outs and connections, and level crossing gate equipment. Chapter IX explains the preparation of a signalling scheme, while Chapter X deals with principles and examples of interlocking. A bibliography and index complete a volume which should be of great use, particularly to those requiring an introduction to the practice and science of mechanical railway signalling.

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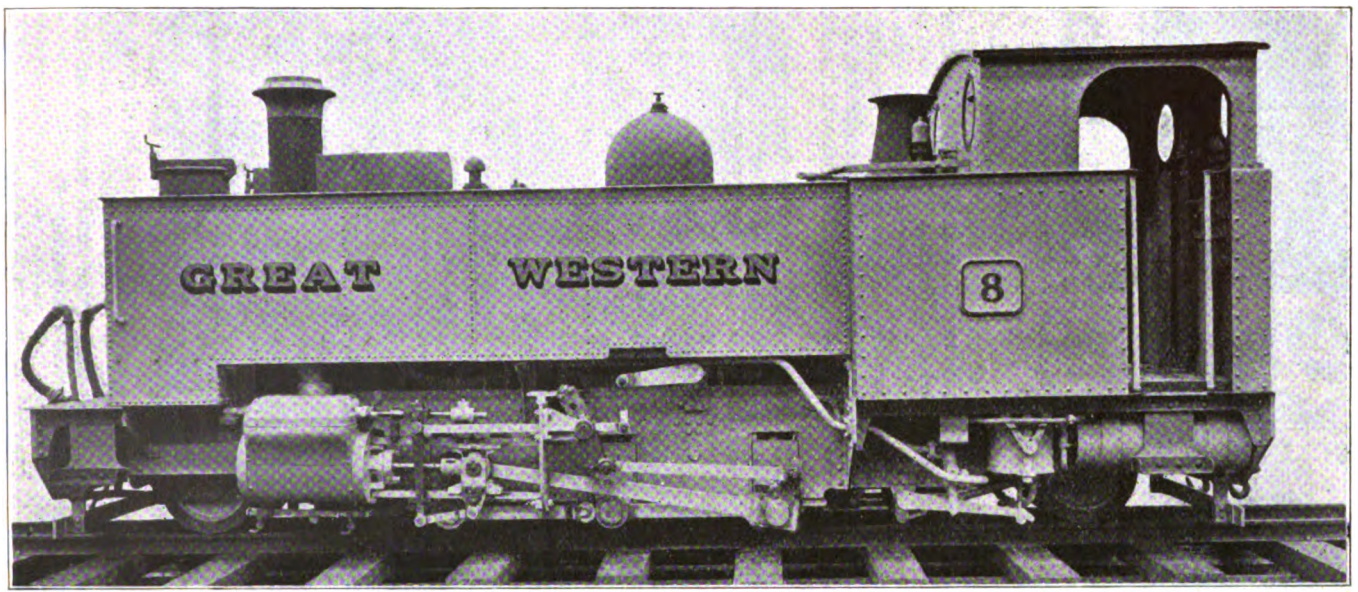
2-6-2 TANK LOCOMOTIVE FOR THE VALE OF RHEIDOL BRANCH, GREAT WESTERN RAILWAY.



By courtesy of Mr. C. B. Collett, Chief Mechanical Engineer, Great Western Railway, we are enabled to illustrate a new 2-6-2 tank engine built at Swindon for the Vale of Rheidol branch, 1 ft. 11½ in. gauge. Leading dimensions are: cylinders, 11½ in. by 17 in.; coupled wheels, 2 ft. 6 in. diam.; steam pressure, 165 lb. per square inch; weight in working order, 25 tons. Gradients of 1 in 50 have to be surmounted.

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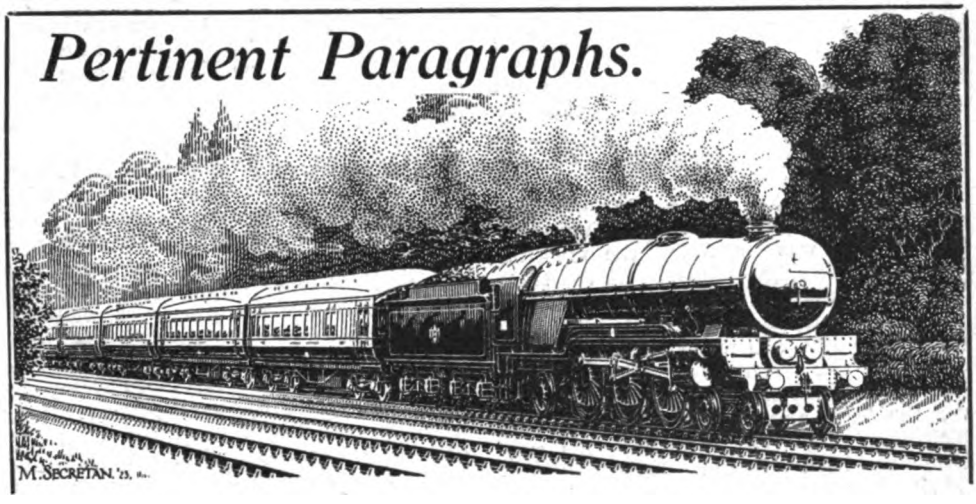
Pertinent Paragraphs.



Engineering Districts on the Southern Railway.

AN important stage has been reached in the reorganisation consequent upon the amalgamation of the London and South Western, London, Brighton and South Coast, and South Eastern and Chatham systems to form the Southern Railway, in that the allocation of the districts for which seven district engineers under Mr. A, W. Szlumper, C.B.E., Chief Engineer, will be responsible, has been settled. The areas placed in charge of the respective district engineers agree only partially with the old spheres of ownership. Thus the London East District, in charge of Mr. C. A. G. Linton, with headquarters at London Bridge, includes South Eastern and Chatham and London, Brighton and South Coast lines within the London area and onwards to Port Victoria and to the outskirts of Rochester via Gravesend and via Sole Street and Tonbridge via Orpington and Sevenoaks. The London West District, in charge of Mr. H. I. Bond, with headquarters at Clapham Junction, consists chiefly of London and South Western lines, and extends as far as Reading, Basingstoke and the Aldershot and Alton routes to their junctions with the Central District lines.

The Portsmouth District, under Mr. C. V. Hill, with headquarters at Brighton, includes all sections of the " Brighton " system west of the Brighton main line and south of Leatherhead, together with London and South Western lines south of Guildford, most of the lines in the Portsmouth district, and the Isle of Wight lines. The Southern District, in charge of Mr H. E. Robarts, with headquarters at East Croydon, includes the Brighton main line and " Brighton " sections east thereof, together with both " Brighton " and South Eastern and Chatham lines south of Norwood Junction, South Eastern and Chatham lines in the Croydon and Redhill district, and the route from Redhill and via Oxted to Tonbridge, Tunbridge Wells and Bexhill and Hastings.

The Eastern District, in charge of Mr. J. Shaw, at Ashford, covers the remainder of the South Eastern and Chatham section, that is, east of Tonbridge and Hastings, Rochester and Chatham, and the Maidstone group of lines from Swanley Junction and including the Otford-Sevenoaks branch. The Central District, in charge of Mr. P. St. J. Bishop, at Eastleigh, consists almost entirely of London and South Western lines west of Basingstoke to beyond Gillingham, south-westerly to Wimborne, Hamworthy Junction and Dorchester, and south to Fareham and Gosport from Eastleigh, together with the Southampton and Bournemouth main line from Basingstoke. The Western District, in charge of Mr. W. H. Shortt, at Exeter, includes all lines from Wimborne and Templecombe westward, including the Somerset and Dorset Joint Railway. Previously, there were three engineer's districts on the London and South Western section, two on the London, Brighton and South Coast section,and five on the South Eastern and Chatham section, a total of ten as compared with seven under the new organisation.

Distinguishing Tunbridge Wells Stations.

REFERENCE was made in the September issue of the RAILWAY MAGAZINE (p. 237) to the re-naming of stations on the Southern Railway, where two of the constituent companies have stations in the same towns, or at places of the same name in different counties.

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At Tunbridge Wells, the S.E. and C. section station is named Tunbridge Wells Central, whilst the L.B. and S.C. station remained until recently Tunbridge Wells without any qualification. This peculiarity was emphasised when certain trains ran to both stations. The two stations are not shown on the same sheet time table. In the S.E. and C. section time tables, after the arrival times of such trains at Tunbridge Wells Central was appended the mystical note "to Tunbridge Wells." As the train has already reached Tunbridge Wells the uninitiated in local railway station nomenclature were likely to regard the note as a misprint. The Tunbridge Wells Urban Council suggested to the Southern Railway that the L.B. and S.C. section station be called Tunbridge Wells West. This suggestion has been adopted. Locally "Tunbridge Wells South" was supported for the L.B. and S.C. station and "Tunbridge Wells North" for the S.E. and C. station.

Another Through Service Development.

YET another development is the inauguration of a through service between Wolverhampton and Birmingham and Brighton by the Great Western route, via Reading and Redhill. It is associated with the popular service already in operation between Birkenhead, Chester, Wolverhampton and Birmingham and South Eastern and Chatham destinations, this further development being easily practicable now that the whole of the route south and south-east of Reading belongs to the Southern Railway. The through carriages thus use the South Eastern and Chatham line between Reading and Redhill transferring at the latter place to or from the "Brighton" line, where in one direction an existing train is to be routed via Redhill in order to convey the through carriages. The value of through services of this kind goes much beyond their direct importance, in that at both ends there are connecting trains for various destinations, but which involve easy and convenient changes, so that, in practice, this service connects the whole of the Great Western system north of Wolverhampton and the various branches in the Birmingham district with the south coast resorts east and west of Brighton.

New Through Services.

ALTHOUGH trains having notable schedules specially adapted to meet the needs of the summer months are usually withdrawn at the end of September, unless maintained through or during part of October, a number of the special train service developments which belong to the record of 1923 will remain in operation throughout the winter. Thus, the King's Cross - Harrogate - Ripon - Newcastle Pullman car express is to be continued in view of the importance of the winter traffic to and from the two Yorkshire spas served by it, in combination with its value to business people. Many of the improved connections and accelerated through-traffic facilities which figured so prominently in the 1923 programme of summer train services will be retained as permanent features. Special through services such as those between Aberdeen and Penzance will also be continued in view of the fact that they provide facilities of value to business people as well as to tourists and holiday travellers. Indeed, instead of withdrawals, certain of these facilities are to be still further developed, as by the provision of a through carriage between Glasgow and Torquay on the East Coast Aberdeen-Penzance service, and by a through carriage between Hull and Swansea on the Newcastle-Swansea through train. Necessarily, as a holiday service, the special London-Scarborough trains are not continued throughout the winter, but passengers can leave King's Cross as late as 4 p.m. and reach Scarborough the same evening.

Another through service development is the introduction by the London Midland and Scottish Railway of a through service between London and the Wirral system, through carriages being provided between Euston and Hooton, West Kirby and New Brighton. Further through carriages have also been instituted between St. Pancras and Halifax. Mention may also be made of the improved facilities given to Chesterfield by the London Midland and Scottish route; also the continuation of the through trains between Lincoln and Bournemouth via Nottingham, Leicester, Birmingham, Bath, &c., and the maintenance of the through service between Liverpool and Manchester and the eastern counties as between Liverpool, Manchester and Nottingham. Additional trains between "Tilbury" line stations and Broad Street may also be referred to. On the London and North Eastern line, the Sheffield-Aberdeen through carriages will run to and from Glasgow.

Further Grouping Developments.

"BELMONT," a keen observer and close student of locomotive developments, sends some remarks in regard to locomotive affairs under grouping. He points out that following the 13 0-8-4 tank engines placed in service on the London Midland and Scottish Railway as mentioned on page 334 of the October RAILWAY MAGAZINE, the next three engines have been numbered 7943, 7944 and 7945. No. 1870 is now numbered 9057. As regards other locomotives which have been renumbered, No. 3008, previously No. 1658, a special DX rebuilt engine,

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is now No. 8015. Of the side tank coal engines, No. 850 is now No. 7583, while Nos. 3769 and 3775 have become Nos. 7772 and 7778, respectively. Of the "Claughton" class, Nos. 2499, *Patience*; 2511, *Croxteth*; 1599, *John O'Groat*; 484 (unnamed); and 1407, *L/Cpl. J. A. Christie, V.C.*, have become Nos. 5967 to 5971, in order of running numbers. "Belmont" also points out that of the additional 4-4-2 tanks placed in service on the London, Tilbury and Southend section, Nos. 2110 to 2117 have plates inscribed "Midland Railway Rebuilt Derby, 1923," and have the Midland crest on the side tank alongside the number. Nos. 2118 and 2119, however, have "L M S" on the bunker over the date plates. With regard to G.M. Hayward's notes, quoted on page 332 of the October number, "Belmont" points out that S.M.J. No. 7 was originally a London, Brighton and South Coast Railway locomotive of the "C" or "Jumbo" class, either No. 428 or No. 430, but not No. 420 as stated.

On the Great Eastern section of the London and North Eastern Railway the ten new engines of the "Super Claud" 4-4-0 class, Nos. 1780-1789E, have now been completed and ten new 0-6-0 tank engines are in hand, Nos. 31 to 33 being already in service. "Belmont" mentions that 0-6-0 tank engine No. 191 was recently noted still painted blue, probably the only engine which has retained any vestiges of the old Great Eastern colour. He also mentions that Colne Valley 0-4-2 tank engine No. 1 and 2-4-2 tank engines Nos. 2 and 4, illustrated in the August, 1923, number, are now at Stratford, their places being taken by Great Eastern engines. In regard to Great Central locomotives, "Belmont" points out that No. 1167, *Lloyd George*, has had its nameplate removed. This engine, together with No. 1166, *Earl Haig*, is now stationed at King's Cross. Great Central 2-8-0 No. 17 and 4-6-0's Nos. 195 and 1072 have been working on the Great Northern section. On the Southern Railway, ten of the "B4" class have now been rebuilt similarly to No. 55, London, Brighton and South Coast section, and two more will probably be completed by the time these notes are published. The rebuilt engines have not been painted, pending a decision as to the new livery to be adopted. Several goods and mixed-traffic engines have, however, been painted in the former passenger livery, including 2-6-0 No. 344, hitherto unpainted.

Screens Alongside Railways.

THE April, 1923, number of the RAILWAY MAGAZINE contained some information respecting the covered-in Turkey Mill Viaduct near Maidstone East station, on the L.C. and D. line of the Southern Railway. This example of screens to hide railways is peculiar, because it covers in a viaduct, but other screens are frequently provided alongside railways. They have usually been constructed as part of the price paid to obtain Parliamentary sanction for the line. In most cases such screens are provided when railways run close to and parallel with a public highway, to prevent horses and other animals using the road being frightened by the trains. The widened main line of the L.B. and S.C. section, constructed 23 years ago, provides a good example at Coulsdon. The screen in this case is a "covered way" for the railway. At Coulsdon the widened lines cross above the highway by an under-bridge, which is boxed in, making a covered way through which the railway passes. This covered way is continued for some distance, as the railway runs alongside the highway. It extends to the point where the road passes under the old main line, beyond which the covered way is not continued, as the widened line is no longer alongside the road.

Approaching Polegate Junction from the London direction, the Hastings line of the late L.B. and S.C. Railway runs close alongside and parallel with the main road for about a mile. Here a screen is provided by means of an extremely dense and lofty hedge, about 15 ft. in height. For part of the distance the railway and road are both practically at ground level, whilst for the remainder the railway is in a shallow cutting. As the railway draws away from the road the hedge screen is strengthened by a plantation between the screen and the railway. Between Newhaven and Lewes the Seaford branch of the late L.B. and S.C.R. runs close alongside the Lewes-Seaford road for about 300 yards. Here a screen in the shape of a high flint wall is provided. Screens, mostly of trees, frequently have had to be provided by railway companies to block out the view of the iron road from the house of a local landowner, as part of the price paid to avert the opposition of these local magnates.

London and North Western Railway in the West Riding.

ALTHOUGH it is three-quarters of a century since the London and North Western Railway became established in West Yorkshire, comparatively little was done during most of this period to cultivate competitive passenger traffic between London and the district. The distance is 24 miles longer than by the Midland route, and exceeds that of the Great Northern Railway by about 35 miles. The Huddersfield and Manchester Railway, which acquired the Huddersfield Canal, on which is

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the original of the celebrated Standedge Tunnels, 3 miles 8 chains in length, incorporated in 1845, was taken over by the London and North Western Railway in 1847. The railway built at various times three parallel tunnels, the newest completed in 1894 with a double line of rails, and the two older ones each form single line. There is also a viaduct of 47 arches near Huddersfield. The first section opened of the Huddersfield and Manchester Railway 3½ miles in length, was not towards Manchester, but northward from Huddersfield to Heaton Lodge Junction with the Manchester and Leeds Railway, and was opened August 3, 1847. The line was opened throughout in the latter part of 1849.

Photo.] LONDON, MIDLAND & SCOTTISH RAILWAY. *[E. L. North.*

Nottingham-Walsall and Wolverhampton express approaching Brownhills. London & North Western 2-4-0 engine No. 619, "Mabel."

The Leeds, Dewsbury and Manchester Railway, which was also incorporated in 1845 and acquired by the London and North Western Railway in 1847, provided a continuation to Leeds by passing over the Lancashire and Yorkshire Railway between Heaton Lodge Junction and Dewsbury Junction, near Thornhill. It was opened in August, 1849. There is now an alternative route between Stalybridge and Leeds, via Heckmondwike, instead of via Dewsbury, which adds 1½ miles to the length of the journey between Leeds and Stalybridge. The distance via Dewsbury is 35½ miles. The collision on July 5th calls to mind that the line for 6 miles, from Stalybridge to Diggle, at the east entrance to the Standedge Tunnels, has been duplicated, the old line being on one side of the canal and the new on the other. The distances are the same within less than 300 yards. On the west line is a tunnel and on the east two viaducts. Local passenger traffic is not now conducted on the east line.

Running Powers for Competitive Service.

THE main routes of railways are not in all cases the sole property of the particular line. Certain of them are in part composed of joint lines of which, however, the particular railway is one of the joint owners. Other main routes (by means of statutory running powers) even make use of lengths of railway owned by competing lines. The user by the Southern Railway (London and South Western section) of 1 mile 27 chains of the Great Western Railway at Exeter, including the use of St. David's station, is a well-known example of this character. A point about this case is that the competing trains between London and Plymouth and *vice versa* pass over this section of line in opposite directions, *i.e.*, a Southern Railway train from London to Plymouth is more than 1¼ miles further from its destination, by the Great Western route, when it leaves the latter company's metals than it was when it entered them. A less lengthy, but if competition existed, equally important hiatus occurs on the late London and North Western Railway route from the South to Huddersfield and Leeds. The trains of the London and North Western

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Railway reached the Joint (Great Central and London and North Western) station at Stalybridge by two routes from Stockport: (*a*) by the spur from Denton Junction to Guide Bridge (Great Central) and thence over the Great Central Railway; (*b*) by the practically parallel London and North Western line, opened in 1894. The latter passed on to the former route 26 chains before reaching the joint station at Stalybridge, west of that station. The line was also Great Central for 4 chains east of the station, where the junction with the London and North Western Railway line to Huddersfield and Leeds is reached. It is, therefore, necessary for London Midland and Scottish trains on the main line to Leeds to pass over 30 chains of London and North Eastern line between the two sections of its own main line, whilst the London Midland and Scottish Railway partly owns a station on this length of purely London and North Eastern Railway line.

The London and North Western Railway had a third route between Stockport and its Leeds line, via Denton Junction, Ashton Moss Junction and Crowthorn Junction, all in the neighbourhood of Guide Bridge. At Crowthorn Junction, it passed on to the Oldham, Ashton and Guide Bridge Joint (Great Central and North Western) Railway, which it used to Oldham, rejoining the London and North Western Railway by an end-on junction 17 chains west of Glodwick Road (Oldham) station. This line runs into the Leeds line at Greenfield, 4½ miles east of Stalybridge. The joint line passes on to and off the late Lancashire and Yorkshire Railway near Charlestown. By making use of the Manchester–Stalybridge line between Charlestown (Oldham Road) Junction and Stalybridge, the late London and North Western Railway had a third route to the last mentioned place. Thence it used 28 chains of the Great Central Railway before reaching its own metals.

Duplicate Running Roads.

LENGTHS of railway on which there are two roads for up and two roads for down trains are usually arranged either with the up and down fast (or main) lines on one side and the up and down slow (or relief) lines on the other side, or with the two down roads on one side and the two up on the other. Amongst others, the late Midland Railway affects the former plan and the late Great Northern Railway the latter method. There is a third arrangement employed on the late South Eastern & Chatham Railway between Belvedere Road signal cabin (south of the Charing Cross river bridge) and Metropolitan Junction, where the lines serving Cannon Street diverge from those for London Bridge. Over this section of railway—about a mile in length, are four sets of metals. Both the outer lines are for up trains, whilst the two inner pairs are reserved for down trains. At first sight this appears an awkward method, but in actual working it has proved to be a useful plan, especially with regard to down trains calling at Waterloo Junction station, where all down trains are thus enabled to use one side or the other of the centre island platform, a distinct convenience where trains are likely to run on either line.

East of Waterloo Junction station are two sets of scissors crossings (or junctions), one between the outer or up lines and the other between the inner or down roads. This involves a complicated layout of crossings and also occupies a fair length of railway. Under existing working arrangements, however, the northern up and down lines east of these scissors junctions, as far as Metropolitan junction, are not normally used for loaded train running, such traffic being worked over the two southern lines while the northern pair are reserved for empty trains. In the morning, certain up trains after discharging passengers at Cannon Street work out on the up line towards Charing Cross and between Metropolitan Junction and the scissors junctions at Waterloo Junction stand close behind one another, as opportunity offers passing forward one by one beyond Waterloo Junction under usual block working to Charing Cross, where they are utilised for down trains or sent empty to the various sidings down the line. Empty trains from Charing Cross in the morning similarly are parked on the down local line between Waterloo Junction and Metropolitan Junction, being released under absolute block regulations, *via* Cannon Street, to form down loaded trains thence, or dispatched empty to the carriage sidings down the line.

Trains for the Evening Rush.

THIS method is reversed in the afternoon, with the utilisation of an additional line for parking empty trains, No. 3 up line between Spa Road and Southwark Park stations being reserved for this purpose. From this standing line, the empty trains are worked forward under block conditions to either Charing Cross or Cannon Street. Those which are to work as down loaded trains from Cannon Street reverse at Charing Cross, go out to the down local road and are parked between Waterloo Junction and Metropolitan Junction, passing thence as required under block working to Cannon Street, where they take up a booked loaded working. Empty trains that run from Spa Road to Cannon Street reverse at the latter and proceed to the parking line (up local) between Metropolitan Junction and Waterloo

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Junction. From the latter they proceed under block working to Charing Cross, loading up there for the down service according to programme. As an empty train is signalled off any of the parking lines the trains behind it draw forward, and another empty enters the parking line at the rear.

Up Side by Side. Down Side by Side

AT Borough Market Junction, where the up and down lines from Metropolitan Junction, (Charing Cross) meet the two pairs of up and down lines serving Cannon Street, the arrangement of lines is two up roads on the north and two down roads on the south—a disposition which provides the minimum of fouling at this junction. This lay-out of up lines* on one side, and down on the other is continued till just west of Spa Road station, where the southern down road crosses the northern up line, which bifurcates. The lines thence consequently are arranged as follows :—two down, two up, one down and one up, counting from north to south. This lay out continues till east of Southwark Park station, where after junctions between the three up lines, (which become two, the three down lines also merging into two) the arrangement of lines is—down, up, down, up. Within a distance of 3¼ miles this section of railway thus has its lines arranged on three systems, *i.e.*, (*a*) up, down, down, up, (*b*) down, down, up, up, (*c*) down, up, down, up, the last method being continued as far as Orpington, beyond which there are the usual two lines only.

Development of the S.E. Method.

ORIGINALLY there were only three lines between Charing Cross and Cannon Street West (now Metropolitan Junction). These all continued to Cannon Street, but there were—as now—only two between Cannon Street West Junction and Borough Market Junction. The lay-out between Storey Street Junction (now operated from Cannon Street No. 2 cabin) and Charing Cross of the three lines was (counting from the north) up, down, up. The placing of an up line north of the down line was a natural development, as it did away with the necessity of up trains from Cannon Street crossing the down line to London Bridge at Cannon Street West (Metropolitan) Junction. For many years, up to about 1890, the Greenwich up line east of London Bridge was on the north of the down line, thus also reversing the positions of up and down lines. This arrangement dates from the early 'forties when to facilitate train working to and from London Bridge—then a terminus—the Greenwich railway station was the north one of the block. Croydon was next south, then the South Eastern, whilst the London, Brighton & South Coast occupied the south extremity of the block of stations. As the Greenwich railways trains branched off at Corbetts Lane on the left hand the arrangement of the Greenwich railway up trains being on the north side of the down trains, obviated the up Greenwich trains crossing the down line of the other railways and the Greenwich up trains were able to run into the Greenwich station at London Bridge, without fouling the lines used there by the other railways. Originally when the Greenwich and Croydon railways ran over the same metals between Corbetts Lane junction and London Bridge, the former company, the owner of the line, provided the Croydon railway with a station on the north side of the former's at London Bridge. This arrangement necessitated the trains of the two companies crossing each other's path. A Parliamentary Committee on railways enquired of the Greenwich railway its reason for this extraordinary arrangement. After much evasion it was acknowledged that the plan was adopted to give the Greenwich railway a hold over the working of Croydon railway's traffic should the two companies fall out.

Railway Grouping in the United States.

FOR some time past proposals have been made for the grouping of United States railways, and several schemes to that end have been published, though so far the position has not reached the stage of legislation. The matter is complicated by the provisions of the Transportation Act of 1921, and by the setting up of four divisions in the United States constituting rating groups. Some of the proposals, notably that of Professor W. Z. Ripley, take these divisions into account, allocating the various railways so as to come wholly within a given rate-group. The Ripley plan puts the railroads lying in the trunk-line territory (eastern rate-group) into five systems, each having a through line from New York to Chicago. Thus the Pennsylvania system would utilise the through line of the Pennsylvania and its affiliated companies; the New York Central system would utilise the New York Central through line; the Baltimore and Ohio-Reading system would make use of the Baltimore and Ohio line from Philadelphia and Baltimore to Chicago, and add to it the Philadelphia and Reading and the Central of New Jersey, giving it a line into New York; the Erie and Lehigh Valley-Wabash system would use the Erie through line between New York and Chicago; and the Lackawanna-Nickel Plate system would

* There are three down lines eastward from London Bridge.

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combine the Delaware, Lackawanna and Western line from New York to Buffalo, and the New York, Chicago and St. Louis line from Buffalo to Chicago. Also, with attention to the rate-groups, it is proposed to form one system out of the New England lines, another out of the railways in the Michigan peninsula, and two railways connecting the coalfields of West Virginia and tidewater on the east and middle-western cities on the west—one the Chesapeake and Ohio, and the other a combination of the Norfolk and Western and the Virginian Railway. In the south-eastern rate-group the railways proposed are the Southern, Atlantic Coast Line and Louisville and Nashville, Illinois Central and railways to be consolidated with it; a combination of various railways with the Seaboard Air line; and the Florida East Coast and other railways. West and south-west of Chicago seven systems are suggested: Union Pacific; Chicago, Burlington and Quincy and Northern Pacific; Chicago, Milwaukee and St. Paul and Great Northern; Chicago, Rock Island and Pacific and Southern Pacific; Atchison, Topeka and Santa Fé; St. Louis and San Francisco; and the Missouri Pacific, in each case involving the combination of various smaller systems.

Alternative Schemes.

Two other schemes pay less attention to questions of rating, and are designed rather to set up trans-continental systems, the idea being that standard traffic routes shall come within given systems. The scheme proposed by Mr. Hale Holden, President of the Chicago, Burlington and Quincy Railway, suggests, as Group No. 1, all railways within a base line extending from Duluth through St. Paul and Minneapolis to Chicago, and south from there to St. Louis, and including the Great Northern, Northern Pacific, and Chicago, Burlington and Quincy Railways. Group No. 2 would include the Atchison, Topeka and Santa Fé, Chicago and North Western, Minneapolis, St. Paul and Sault Ste. Marie, Chicago and Eastern Illinois, Western Pacific, and part of the Denver and Rio Grande Western. Group No. 3 is founded on the Southern Pacific, and would also include the Chicago, Rock Island and Pacific, El Paso and South Western, Missouri Pacific, Missouri, Kansas and Texas, Denver and Salt Lake, and the remaining half of the Denver and Rio Grande Western. Group No. 4 combines the Union Pacific, Los Angeles and Salt Lake, Chicago, Milwaukee and St. Paul, St. Louis and San Francisco, Wabash, Texas and Pacific, and International and Great Northern.

It will therefore be seen that opinions differ widely as to the best methods of grouping, but it remains to be seen which proposals will be definitely adopted if, and when, the grouping of United States railways comes definitely to the fore.

Distances on Branch Lines.

THE single track branch of the old S.E. section of the Southern Railway known as the Westerham Valley line diverges from the direct Tonbridge line at Dunton Green, a wayside station 1 mile 43 chains north of Sevenoaks (Tubs Hill). Authorised in 1864 (four years before the opening of the line through Dunton Green from which it branches), it was not opened till 1881. The branch has one intermediate station—Brasted—whilst in more recent years a "halt" has been opened at Chevening. A peculiarity of the mileage table of the S.E.R. was that it gave the distance to the buffer stops at Westerham as well as to the station platform, thus: (distances from Dunton Green) Chevening Halt, 1 m. 24 ch., Brasted 3 m. 14½ ch., Westerham 4 m. 60½ ch., Westerham (buffer stops) 4 m. 64½ ch. The branch was originally worked by train staff and ticket, but electric train tablets are now employed, although usually there is only the branch train on the line. From its first opening there has been a liberal service on the branch, but with war curtailments lasting up to last year, the last up train (except on three days a week) left Westerham at 7.45 p.m. In the 'eighties the last was after 10 p.m., and gave a connection to London, an unusual lateness for so unimportant a town. The original branch train was formed of old light 4-wheel coaches, improved and re-decorated for the service, with the third-class carriages cushioned—probably the first to be so provided on the S.E.R. The branch engine was a Cudworth 2-4-0 with tender. For some time prior to the war, the branch service was provided by a steam rail motor.

Unusual Branch Working.

CERTAIN passenger trains on the branch are worked by two engines—one at the front and the other at the rear. This unusual plan is carried out to avoid undue shunting at Dunton Green and Westerham. An empty train, with engine at each end, leaves Sevenoaks (Tubs Hill) at 8.5 a.m., and is divided at Dunton Green beyond the branch junction. The junction connects only with the up main line at Dunton Green. The rear part of the divided train forms a school train for Tonbridge and by means of the crossover road draws up without shunting at the Dunton Green down platform ready to start on its journey. The front portion backs down to the branch platform, and is coupled up to the back of the branch train.

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The combined branch train consequently has an engine at each end. The double train returns from Westerham at 8.40 a.m. in the same formation with an engine at each end, and on reaching Dunton Green is divided. The front engine and its portion of the train (that from Sevenoaks) runs over the main line to Cannon Street, and is the only through train from the branch. The rear portion, *i.e.*, the branch train with the engine at the back, takes up the branch working according to time table.

The return through train from London reaches Dunton Green at 5.51½ p.m. Here it is divided, the engine and front part running forward to Sevenoaks where the train terminates. The branch engine, detached from its own train, couples on to the rear of the through train and takes it to Westerham, but without the branch train. The engine that brought the train from London, upon arriving at Sevenoaks, puts the coaches in a siding, and at 6.14 returns light to Dunton Green, where it picks up the branch train and leaves with it at 6.25 for Westerham, so that two trains work down the branch without an up train between. The next up train—6.48 from Westerham—is hauled by both engines (at the front) over the branch, the extra engine leaving Dunton Green light for Sevenoaks at 7.20. This evening light working arises from the circumstance that the down through train has also a portion for Sevenoaks, whilst the whole of the up through train is from Westerham.

Great Western Birmingham-Dudley Working.

SIXTY to seventy years ago the "battle of the gauges" raged furiously in the Black Country. The G.W.R. was at Birmingham; its ally, the Oxford, Worcester and Wolverhampton Railway, was at the town last mentioned in its title, reaching it through Dudley. The G.W.R. was extending from Birmingham to Wolverhampton through West Bromwich, whilst the South Staffordshire Railway from Dudley ran through Walsall and Lichfield to Wichnor Junction, where it joined the Midland Railway, its trains running forward to Burton and Derby. The South Staffordshire Railway did not work its line; a contractor provided the locomotives, coaches and trucks. At one time the L. and N.W.R supplied the engine power, whilst eventually the S.S.R. was absorbed by the L. and N.W.R.

In 1863 the G.W.R. obtained authority to construct a short branch from Swan Village, through Great Bridge, to join the South Staffordshire Railway at Horsley Fields Junction, with running powers over the S.S.R. to a junction with the O.W. and W. Railway at Dudley. This provided the G.W.R. with a short route between Dudley and Birmingham, and an alternative route between the latter town and London. This connecting line between Swan Village and Horsley Fields Junction was opened a few years later. The G.W.R. has also a slightly shorter Worcester-Birmingham route *via* Lye.

As a result of association thus set up in years gone by, G.W.R. trains between Birmingham and Dudley, consequent upon the L.M. and S.R. ownership between Horsley Fields Junction and the junction of the L.M. and S.R. with the G.W.R., 8 chains south of the former's Dudley station, now perform peculiar "in and out running." These trains (rail motors) leave the G.W.R. main line from Birmingham to Wolverhampton, &c., at Swan Village, the junction being 12 chains south of the station, which has platforms on both the main line and branch. On the branch, 1 mile 15 chains from Swan Village station, is Great Bridge station, the L.M. and S.R. Great Bridge station being near by, on the late L. and N.W. branch from Walsall to Dudley; the G.W.R. collecting line ends by a junction at Horsley Fields with the L. and N.W. Dudley branch, 18 chains south of Great Bridge station. On this section of the L.M. and S.R., 1 mile 69 chains in length, are Dudley Port (low level) and Dudley (L.M.S.R.) stations. G.W.R. trains do not call at either of these stations. Eight chains south of its Dudley station, the L.M. and S. line terminates by joining the Stourbridge-Wolverhampton line of the G.W.R. G.W.R. rail motors from Birmingham run over this junction, and then set back into a bay in the G.W. Dudley station, which is alongside of the L.M. and S.R. G.W.R. rail motors from Dudley to Birmingham reverse the process at Dudley, and also pass through, without stopping, Dudley and Dudley Port stations on the L.M. and S.R. section of line.

Railways Amalgamation Tribunal.

ON Friday, September 28, the Railways Amalgamation Tribunal held its last public sitting. Its task was practically completed early this year with the settlement of the Caledonian case and the final amalgamation of the London Midland and Scottish Company, but outstanding absorption schemes in each group, of a difficult and highly contentious character, have since claimed all its attention. The last four of these cases, one in each group, were considered at the sitting. The Midland and South Western scheme was settled without difficulty, and the Brighton and Dyke scheme will be settled subject to amendment, but the Mid-Suffolk and the Leek and Manifold

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absorptions presented many complications. A number of questions of law arose on these two cases, and the Tribunal accordingly agreed to state a case on each for the decision of the Court of Appeal. Both are cases of insolvent companies, with liabilities far in excess of the value of the undertakings, and however the Act is applied it is difficult to avoid apparent injustice to one or other of the parties concerned.

It will, however, we think, be agreed on all hands that the task entrusted to the Amalgamation Tribunal has been carried out with conspicuous ability and success. When the Tribunal commenced its work in September, 1921, there were apparently many obstacles and difficulties in the path, but one by one, with the cordial co-operation of the railway companies and by the exercise of tact and common sense, these have been removed, and, save for the small points indicated, the work has been brought, in a much shorter time than was generally anticipated, to a successful conclusion.

It is with the deepest regret that, in thus recording the practical completion of the Tribunal's work, we have also to chronicle the untimely death of the President of the Tribunal, Sir Henry Babington Smith. He died only the day after the last public sitting. Together with his colleagues, Sir William Plender and Mr. G. J. Talbot, he extended unfailing courtesy and consideration to all who came before the Tribunal, and his loss will be deeply felt.

G.W.R. Stimulus for 20-ton Wagons.

ADMITTEDLY the high-capacity wagon is desirable as a means of obtaining a good load-tare ratio, but hitherto it has been recognised in practical circles that the time is not yet ripe, nor are conditions suitable for its general employment on British railways. For a long time, however, there has been a distinct tendency towards the use of *four-wheeled* wagons of increased capacity. In fact, the railway returns for 1922 show that although the great bulk of the freight stock consists of wagons of under 12 tons capacity, there were approximately 31,000 of between 12 and 20 tons capacity, and about 20,000 four-wheeled wagons rated for 20-ton loads or over. In the latter class the North Eastern Railway was principally concerned, having a total of no fewer than 18,193. A distinct lead, however, has been given by an invitation by the Great Western Railway Company recently made with a view to inducing the introduction of 20-ton mineral wagons on a large scale. It was pointed out that the cost of constructing two 10-ton ordinary wagons is, roughly, 50 per cent. more than the cost of a 20-ton wagon, and as the number of private owners' coal wagons in South Wales (mostly of 10-tons capacity) is about 116,000, the advantages to be realised in regard to an improved load-tare ratio, reducing running resistances, shortened lengths of trains and increase of load within practical limits of length and engine capacity, will be obvious. The most important point is, however, that to render the change practicable from the railway aspect (and in the long run advantageous to traders also) the invitation was accompanied by the offer of a rebate of 5 per cent. off the rates charged, to apply to coal traffic conveyed wholly over the Great Western system in fully loaded 20-ton wagons. With such a lead the coal owners of South Wales will be well advised to proceed with the introduction of such wagons.

Acceleration on the South African Railways.

ON August 16 last, at 8.45 a.m., a train composed of 10 bogies hauled by one of the most powerful and modern engines owned by the South African Railways and Harbours Administration left Johannesburg for Cape Town in order to demonstrate what could be accomplished by way of accelerating the times of the present weekly mail-boat express running between those two points, a distance of 956 miles covered in 36 hours. The train was made up of the engine, eight saloons, a dining-car and van, the gross weight, exclusive of the engine being 360 tons.

The train had been scheduled to cover the distance in 30 hours 8 minutes, which would have given a speed averaging 30·8 m.p.h., including all stops, or 34·18 m.p.h., excluding stops. The actual time taken was, however, 27 hours 40 minutes, that is 2 hours and 28 minutes less than the scheduled time; the speed for the entire journey, including stops, averaged 34·55 m.p.h., or, excluding stops, 36·8 m.p.h. The return trip was made under similar conditions to the outgoing one, although the schedule was longer. The train was timed to leave Cape Town at 11 a.m. on August 20, and to reach Johannesburg at 7.37 p.m. the following day, but as a matter of fact it arrived at its destination at 4.30 p.m., having made up 3 hours 7 minutes on the 32 hours 37 minutes schedule.

On the De Aar-Kimberley section, a distance of 146·45 miles, a speed of nearly 60 m.p.h. was attained. The test-train runs must be considered highly satisfactory from all points of view. The following figures may be of interest as showing the undulating nature of the country traversed :—Johannesburg is 5,735 ft. above sea level; Potchefstroom, 88 miles, distance, 4,436 ft.; Kimberley, 308·36 miles from Johannesburg, 4,012 ft.; De Aar, 4,079 ft.; Nelspoort, 130 miles from De Aar, registers a further drop of 915 ft; from Nelspoort to Fraserburg Road

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a distance of 80 miles, a further drop of 1,440 ft. occurs. From Kruidfontein, 6 miles beyond Fraserburg Road, to Weltevreden, a distance of 13 miles, there is a rise of 492 ft., the ruling gradients being rather severe. Between Laingsburg and Pietermeintjes, a distance of 29 miles, there is a rise of 1,428 ft. The severest section is over the Hex River Pass, between Kleinstraat and De Doorns. Between Johannesburg and Kleinstraat, a distance of 795 miles, the ruling grade is 1 in 66. Between Kleinstaadt and Triangle, which is practically the summit, the line rises 396 ft. in 6 miles ; from Triangle to De Doorns, a distance of 16 miles, there is a drop of 1,577 ft. The ruling grade over the Kleinstraat-De Doorns section, is 1 in 40 in the De Doorn direction with a minimum uncompensated curve of 5 chains radius. From De Doorns to Cape Town the line is comparatively easy, dropping an altitude of 1,570 ft. to 15 ft. in 129 miles.

A train from Johannesburg to Cape Town via Kimberley was run on March 18, 1922, the journey being accomplished in 30 hours 27 minutes at an average speed of 31·39 m.p.h. It will be seen, therefore, that the test train which ran on August 16 last, broke this record by nearly three hours, truly no mean record on a 3-ft. 6-in. gauge railway.

G.W.R. and Season Ticket Rates.

In view of the wide public interest in the season-ticket question, coupled with doubts as to the extent to which the railway companies are likely to increase charges in cases where, when the new rates are settled by the Railway Rates Tribunal, the maximum charges allowed represent increases upon those at present in operation, it is satisfactory to find the Great Western Railway assuring their season-ticket holders "that the directors will be very definitely opposed to any increases." According to a statement officially issued, while the Great Western Railway is in the same position as other companies, in that they have been required to tabulate standard schedules, they fully recognise that where cheap season-ticket rates have been instituted the reasons which caused them to be arranged still apply. Indeed, the recent action of the company indicates that this aspect is very fully appreciated in that where, as in regard to some of the South Wales companies taken over by the Great Western Railway, season tickets were charged on a basis higher than that adopted by the Great Western Company itself, the charges have been reduced. Moreover, in certain districts, special season tickets have been issued, not available at intermediate stations, at rates considerably below those including intermediate facilities. It was also pointed out that while season-ticket holders are perfectly within their rights in approaching the Tribunal, the public should remember that if they desire to tie the railway interest with red tape and insist on every item connected with the railway companies' business being adjudicated upon by a tribunal, they have no right to complain if the result of standardisation is that concurrently with a levelling down there is also a levelling up.

Summer Train Services.

"It is always a matter of some difficulty," writes *Voyageur*, "to steer altogether clear of errors when putting together the tabular matter in regard to the Summer Train Services. This year, in Table A, the London Midland and Scottish Railway is credited with a service from Euston to Edinburgh in 8 hours, whereas the fastest time was 8¼ hours, by both the 10 a.m. and 11.35 p.m. down expresses. In actual running, therefore, the London and North Eastern 8.20 p.m. down Aberdeen express, due at Edinburgh 4.5 a.m., held a clear lead of half an hour over the West Coast route, although as Edinburgh passengers were not conveyed by this train the fastest advertised time was the 8 hours of the 11.40 p.m. down. The 7.45 p.m. and 11.25 p.m. from King's Cross also took 9 and 10 min., respectively, under the 8 hours, but neither conveyed Edinburgh passengers from London. There was a slightly quicker service between King's Cross and Inverness than that shown in Table A, as the 8.40 a.m. from Inverness connected with the 1.45 p.m. from Edinburgh to King's Cross, giving a fastest journey time of 13 hours 20 min., or 10 min. less than the best West Coast time ; this service, by the way, is continued for the winter. Another error was that I showed the 5.55 p.m. down Liverpool express from Euston, London Midland and Scottish Railway, as taking 3 hours 35 min. (the pre-war time) to Liverpool, Lime Street, whereas the present time is 5 min. more, or 2·3 per cent. increase over 1914. This is to allow for the conditional stop at Mossley Hill, which I am given to understand is almost invariably made. Mossley Hill is 189·7 miles from Euston, and the booked arrival time of 9.21 p.m. (206 min.), and the scheduled speed when the stop is made of 55·3 m.p.h., is slightly higher than the 54·2 to Edge Hill shown in Table B. Finally, a correspondent points out that the 9.15 a.m. from Folkestone reaches London Bridge in 79 min., but it is hardly fair to give this as a superior time to the 80-min. bookings to and from Charing Cross, seeing that the latter expresses run between London Bridge and Folkestone in 75 min."

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London Midland and Scottish Railway, New Trains for Fenchurch Street and Southend Service.

THE last of a series of four trains for the Fenchurch Street-Southend service of the London Midland and Scottish Railway will be put into traffic shortly. These trains have been built at the Derby Works, and one is illustrated in the accompanying photographic reproduction.

Each train, exclusive of engine, has a total length of 623 ft., and is composed of 11 vehicles 54 ft. long over bodies; they are short coupled, but have the usual facility for readily parting the train at the centre for use when traffic is light, and at the end for coupling additional vehicles.

There are two types of trains, differing chiefly in the amount of first-class accommodation.

One type has 150 first-class seats and 862 third-class. The other type has 237 first-class seats and 719 third-class. One carriage in each train is provided with lavatory accommodation for both first and third-class passengers.

The vehicles are of the ordinary compartment type, but are 9 ft. wide over mouldings, and will seat 12 passengers in the third-class compartments and 8 in the first-class. The roof is of the semi-elliptical type.

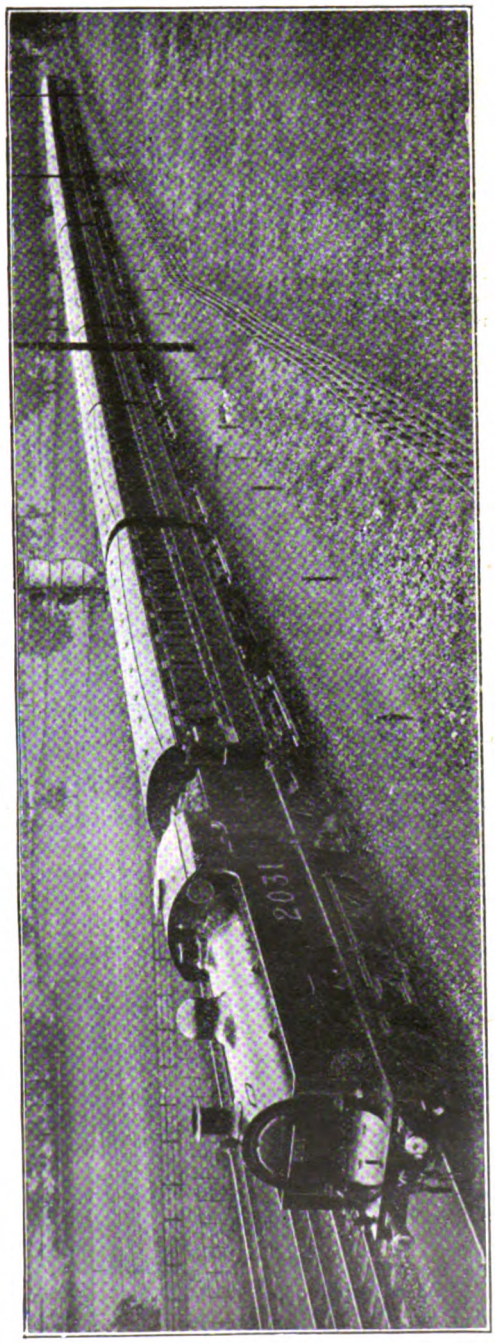
The average tare weight of the vehicles is 25 tons each or 275 tons per train exclusive of engine. The automatic brake is of the Westinghouse type.

The trains are painted outside with the old "Midland red," which has now been adopted for the London Midland and Scottish Railway, and the interior finish of the compartments maintains the company's well-deserved reputation for cleanliness, comfort and smartness.

The third-class compartments are finished in mahogany and trimmed with crimson and black figured velvet; the first-class compartments are finished in walnut and trimmed with blue cloth. The fittings generally are brass and oxydised Venetian bronze.

The trains are heated throughout by steam at atmospheric pressure, and this is utilised for supplying hot water to the lavatories. Electric light is provided, the third-class compartments having three, and the first-class compartments four 12 candle-power lamps; these may be controlled from the guard's van to either "full lights," "half lights" or "off," and each vehicle may be regulated independently in the usual way at one end from outside. Where possible two vehicles receive the current from one large dynamo and single battery. Where vehicles have to be detached and the lighting therefore self-contained, a smaller dynamo is used.

The standard alarm signal apparatus is fitted to all compartments by means of which passengers may, in case of emergency, operate the brakes and call the guard's attention.



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Atlantic City "Flyers."

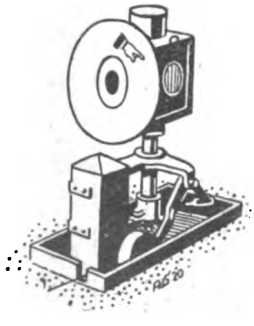
FOLLOWING the paragraphs that appeared under this heading in the October RAILWAY MAGAZINE, we have been pleased to receive from Lord Monkswell a copy of his report on the United States Railways to the Foreign Office, January, 1905, in which he recorded a foot-plate journey made by him on the engine of the Pennsylvania Railway's 4.6 p.m. train from Camden to Atlantic City on June 3, 1904. This train was timed to run the distance of 58·3 miles in 54 minutes. Lord Monkswell's record is as follows :—

The line is a fairly level one throughout, what gradients there are being short and not severe. The worst is a 4-mile rise of 1 in 196 beginning about 11 miles out of Camden. There is a sharp curve a mile or so after the start necessitating a reduction of speed, but after this there is nothing worse than curves of 44 chains radius, and in one place the line is straight for 25 miles together.

The engine was a ten-wheeler with four coupled wheels 6 ft. 8 in. in diameter, a leading bogie and a pair of small carrying wheels under the footplate. The cylinders are 20½ in. in diameter with a stroke of 26 in. ; the steam ports are 20 in. long and 1½ in. wide, and the lap of the slide valve is 1½ in. The area of the grate is 55½ square ft., and the heating surface of the Belpaire fire-box 166 square ft. ; the boiler contains 315 tubes 2 in. in diameter and 15 feet long, making the total heating surface 2,640 square ft. The engine weighs rather more than 81 tons in working order, of which 50½ tons rest upon the four coupled wheels. The eight-wheel tender fully loaded weighs 59 tons.

The train was composed of a 12-wheel luggage van, two 12-wheel Pullman vehicles and four 8-wheel carriages, and weighed (exclusive of engine and tender, passengers and luggage), 229¼ tons.

The weather was fine and there was little wind. At the moment of starting steam was blowing off at 200 lb. per square in. ; there was a thick fire (of coal mostly in large lumps) right up to and above the level of the fire-hole behind and apparently of much the same thickness all over the flat grate. The start took place about a minute late ; it was not possible to begin running hard till the sharp curve which is soon encountered had been passed over, but by the time the third mile-post was passed the speed was already 60 miles an hour, and it had very nearly reached 72 when the four mile bank of 1 in 196 was entered upon. This gradient had the effect of bringing down the speed to 65 miles an hour by the time the summit was reached. After this, on a road flat, or undulating gently with a falling tendency, 40 miles were run in 29 minutes 46 seconds which gives an average speed for this distance of 80·6 miles an hour ; (90 miles an hour was not reached). All this time the engine ran quite smoothly. Steam was kept at or near the blowing off point. The fireman had to work fairly continuously but did not appear to have more to do than one man can conveniently perform on so short a run. In the intervals of a few seconds when he was not firing the fire-hole door was kept partly open. The regulator was from half to three-quarters open and the reversing lever was in the fourteenth notch ; there are in all 32 notches in the sector of the reversing gear ; mid-gear, however, is not exactly in the middle, but somewhere about the seventeenth notch. Between mile-posts 54 and 55 steam was shut off and for some distance before stopping it was necessary to go quite slowly through the streets of Atlantic City. Eventually the train arrived one minute early, the whole distance of 58·3 miles from Camden having occupied 52 minutes 5 seconds, which makes an average speed of 67·1 miles and hour.



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LIEUT.-COLONEL L. B. BILLINTON, R.E., C.B.E., who has retired from the position of Locomotive Engineer of the London, Brighton and South Coast Railway, consequent upon the amalgamation scheme, has been the recipient of a handsome presentation from the departments which have been under his control. The farewell gift, which was made at a smoking concert at the Old Ship Assembly Rooms, Brighton, was a fine silver loving cup mounted on an oak plinth, and bore the inscription: "Presented to Lieut.-Col. L. B. Billinton, R.E., C.B.E., by the Locomotive Works and Running Departments, on his retirement from the position of Locomotive Engineer of the London, Brighton and South Coast Railway, September 28, 1923." Mr. B. K. Field (Works Manager) occupied the chair, and the assembly, which numbered between 200 and 300, had gathered from all parts of the Brighton line.

SILVER LOVING CUP PRESENTED TO COL. L. B. BILLINTON, R.E., C.B.E.

* * *

MR. JAMES KING, Staff Assistant to the General Manager of the Southern Railway, Brighton Section, retired on October 1, after 50 years' service. Of this long period Mr. King had been concerned in staff matters for 40 years, during which time he accumulated an almost unparalleled knowledge of staff details of working, leading ultimately to his appointment, in January, 1918, to the post of Staff Assistant. From very early days Mr. King had interested himself in ambulance work, and was for many years Centre Secretary for the Brighton Railway Section of St. John Ambulance Association, the subsequent high efficiency of which was in no little measure due to his labours and example. In this connection he was presented, in January, 1917, with a resolution of thanks from the Chapter General of the Grand Priory of the Order of the Hospital of St. John, autographed by its Grand Prior, the Duke of Connaught.

* * *

SOUTHERN Railway official appointments are nearing completion.

We are officially informed that the directors at their meeting on October 4, made the following appointments in the General Manager's Department:—

Mr. G. B. Hayne, to be Assistant for Parliamentary and General Purposes.

Mr. W. G. Pape, to be Indoor Assistant.

Mr. W. Major to be Indoor Staff Assistant.

Mr. A. Harris to be Outdoor Staff Assistant.

Mr. F. V. Milton to be Chief of Publicity Section.

Mr. G. H. Dennis to be Chief of Advertising Section.

Portraits of the six officers in question will appear in the December RAILWAY MAGAZINE.

We are advised, likewise, that Mr. A. D. Jones, the Locomotive Running Superintendent took over the Locomotive Running Department of the South Western and Brighton Sections on October 1.

Until completion of reorganisation Mr. B. Whittle, of Eastleigh, and Mr. E. S. Moore, of Brighton, will act for Mr. Jones and deal with matters relating to the Running Department work as affecting the two Sections.

Correspondence relating to the South Western running work should be addressed to Mr. A. D. Jones at Eastleigh, and that in

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MR. C. A. G. LINTON,
District Engineer, London East District, Southern Railway.

MR. H. I. BOND,
District Engineer, London West District, Southern Railway.

MR. H. E. ROBARTS, A.M.Inst.C.E.,
District Engineer, Southern District, Southern Railway.

MR. W. H. SHORTT, A.M.Inst.C.E.,
District Engineer, Western District, Southern Railway.

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connection with the Brighton Section locomotive running work to him at Brighton, excepting on general matters common to all Sections, which should be addressed direct to the Locomotive Running Superintendent's Office at London Bridge. The outdoor carriage and wagon work for the South Eastern Section hitherto under the control of Mr. Jones will be transferred to the Chief Mechanical Engineer as from the same date.

* * *

MR. P. ST. J. BISHOP, who has become District Engineer, Central District, Southern Railway, with headquarters at Eastleigh,

Photo.] [*Elliott & Fry.*

MR. P. ST. J. BISHOP,
District Engineer, Central District, Southern Railway.

had previously held the corresponding appointment on the London and South Western Railway since January, 1912. Born in 1876, educated in Guernsey, and trained at the Crystal Palace School of Engineering, Mr. Bishop became a pupil of Mr. Maurice F. Wilson, at that time engaged upon the construction of the Prince of Wales graving dock and dock extensions at Southampton. Later he entered the service of the London and South Western Railway in the Chief Engineer's Department. He was appointed subsequently Resident Engineer for the construction of the Bulford branch line, afterwards returning to the Chief Engineer's department, being specially concerned with investigations in regard to the alignment of curves and safe speeds of trains thereon, becoming in due course engineer of the Central Division.

* * *

MR. C. A. G. LINTON, who has become District Engineer of the London East District of the Southern Railway, was, in 1920, appointed District Engineer of the Tonbridge Division of the South Eastern and Chatham Railway. In 1899 he entered the service of the London, Brighton and South Coast Railway in the New Works Department, but in 1902 transferred to the Engineer's Department of the South Eastern and Chatham Railway. In 1914 he was Resident Engineer for the construction of the Military Base at Boulogne. In this connection Mr. Linton received the M.B.E. From 1917 to 1918 he acted as Resident Engineer in charge of various works in France.

* * *

MR. H. E. ROBARTS, A.M.Inst.C.E., who has been appointed District Engineer, Southern District, Southern Railway, with headquarters at East Croydon, had been District Engineer in charge of the London District of the South Eastern and Chatham Railway. He joined the Chief Engineer's Department of the South Eastern Railway in 1899. In 1904 he was appointed an assistant in the District Engineer's office at Swanley, transferring to the District Engineer's office at New Cross in 1910, becoming District Engineer for the London District on January 1, 1913.

* * *

MR. H. I. BOND, who has been made District Engineer, London West District, Southern Railway, with headquarters at Clapham Junction, held a corresponding appointment on the London and South Western Railway. He entered London and South Western service in the London District Engineer's office at Clapham Junction in 1900, and was concerned with a number of widening and reconstruction works in progress during the years immediately following. He then transferred to the Chief Engineer's office at Waterloo, being mainly concerned with the design of steel bridges; in 1904 he was attached to the Western District Engineer's office, and was associated with the installation of pneumatic signalling. In connection with the latter he was sent to Paris to investigate signalling experience on the Northern Railway of France. Later, Mr. Bond was concerned with investigations and reports upon the strength of bridges, and was engaged from time to time on work involved by the company's Bills in Parliament. In 1912

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he became Lighting Engineer under the Chief Engineer, two years later taking control also of water engineering. On January 1, 1919, he became London District Engineer.

* * *

MR. W. H. SHORTT, who has been appointed District Engineer for the Western District of the Southern Railway with headquarters at Exeter, joined the Engineer's Department of the London and South Western Railway in 1902 under the late Mr. J. W. Jacomb Hood. While attached to the Chief Engineer's Department, Mr. Shortt established a laboratory attached to the department for the micrographical examination of steel rails, &c. He was appointed in 1906 Bridge Assistant to the London District Engineer. In 1908 he acted as Secretary to a sub-committee of the Railway Engineers' Association on the speed of trains round curves and devised the speed recorder used for obtaining actual and accurate records of the speeds attained on curves. In 1908 he devised a method for improving the alignment of railway curves, and now very generally adopted. A modified method was subsequently developed and is described in a paper which was published recently by the Institution of Civil Engineers. From 1910 to 1914 he was Resident Engineer for various works, but in April of the latter year was appointed Permanent-Way Assistant to the Chief Engineer. During the war Mr. Shortt received a Commission with the Railway Engineers, serving in France and Belgium until 1919. In January, 1922, he was made District Engineer for the Western Division of the London and South Western Railway.

* * *

A SLOUGH reader suggests that in "Voyageur's" article, published in the October number, wherein reference is made to the running of a relief train on Saturdays from Euston to Colwyn Bay, thus approaching in regard to length the Great Western record from London to Plymouth, the latter should also have been credited with the additional mileage made when the 10.30 a.m. from Paddington is run in two sections, as one portion runs through to Devonport.

* * *

OWING to the transposition of the inscriptions to two photographs prepared for reproduction, that shown on page 279 of the October number was incorrectly described. This view showed the 3.35 p.m. down South Wales express drawn by two-cylinder 4-6-0 locomotive No. 2926, *St. Nicholas*.

* * *

FROM Crewe Mr. C. Williams writes :—

Two further new engines of the 0-8-4 tank type will be in service shortly on the London and North Western section of the London Midland and Scottish Railway. They are being painted in the new passenger livery, and will bear the numbers 7948 and 7949. These two engines, which complete the second series, are fitted with "Pop" safety valves, like the rest of the batch. A third and final series of the same type is now in course of construction. Under the new scheme of numbering the engines of this type will be numbered from 7930 upwards, whilst the 30 corresponding engines of the 0-8-2 type have been allotted the numbers 7900 to 7929, inclusive.

The following engines have been painted black and lettered "L.M.S.," and are now running renumbered as shown :—0-6-2 coal tank class : 596–7794, 850–7583, 3005–7567, 3423–7706, 3769–7772, 3775–7778 ; 0-6-0 "D X" class : 3008–8015 ; 0-6-0 coal class : 873–8146, 936–8179, 1330–8199, 3276–8161, 3512–8206 ; 0-8-0 "C" class : 1807–8961, 2541–8953 ; 0-8-0 "D" class : 1866–9002 ; 0-8-0 "G" class : 2660–9087 ; 0-8-0 "G1" class : 1289–9361, 1529–9195, 1885–9267, 2236–9322, 2281–9189. (It will be noted that 9267 was previously 1885, not 1870, as given last month). A second passenger engine will shortly be running in the new colours. This is a 4-4-0 No. 2578 *Fame*, but it is not known yet what number it will receive under the new scheme.

Three more Webb 4-4-0 compounds are being converted into two-cylinder simples, "Renown" class, viz., No. 1927 *Goliath*, No. 1953 *Formidable*, and No. 1977 *Mars*.

Engines at present in the paint shop awaiting renumbering, include five recent conversions to "G1" class, viz., Nos. 1237, 1247, 1436, 2024 and 2074.

The naming of the express engines belonging to this section has been finally discontinued, but those engines which already bear names are to continue as hitherto. As a matter of interest it may be noted that there are now about 670 engines in service bearing names.

* * *

ON the London and South Western section of the Southern Railway the policy of indicating trains, empties and light engines by means of reference numbers is being developed to the extent that, on busy Saturdays, and sometimes at other times, every train or engine leaving Waterloo is thus denoted. The number is placed upon one of the white discs used for the head code.

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It is announced by the Canadian Pacific Railway that their liner *Empress of Canada* —a luxurious oil-burning steamer of 21,500 tons—will proceed on a cruise around the world early in the new year. Calls will be made at Mediterranean ports, Egypt, Bombay, Colombo, Calcutta, Burma, Java, Manila, China, Japan, Honolulu, &c. Detailed itineraries may be obtained from the Canadian Pacific Railway, 62, Charing Cross, London, S.W.1.

* * *

Very fine performances of the Gilbert and Sullivan comic opera, "The Gondoliers," were given at King's Hall, Covent Garden, on October 4, 5 and 6 by the Dramatic Section of the T.O.T. Philharmonic Society. The performers were drawn from the staffs of the London Underground Electric Railway and its allies. The society is singularly fortunate in its stage manager, Mr. Emil Hardy, its conductor, Mr. Ewart Beech and its orchestral conductor, Mr. Charles E. Lambert, each one of whom is to be congratulated upon the high state of efficiency attained by all concerned. Where excellence is so general it is difficult to discriminate, but among the male performers Mr. Cyril Corker and Mr. John Priestley deserve the highest praise, while among the ladies Miss Beatrice Smith and Miss D. Tilly Mitchell were well worthy of the parts undertaken by them. The singing, the dancing and the presentation of the opera generally was much appreciated by the audiences who marked their approval by a plethora of applause and repeated encores.

"THE GONDOLIERS."
Dramatic Section of the T.O.T. Philharmonic Society at King's Hall, Covent Garden.

* * *

The main feature of the 20 ft. by 20 ft. exhibit of the London and North Eastern Railway at the recent International Fisheries Exhibition at Leeds, consisted of a series of eight framed charts, each measuring 50 in. by 80 in., illustrating by means of radiating lines the arrival times at all important centres in Great Britain of wet fish from the principal ports served by the London and North Eastern Railway, namely, Aberdeen (embracing Fraserburgh, Peterhead, Buckie, Lossiemouth and Macduff), Mallaig, North Shields, Hartlepool, Hull, Grimsby, Lowestoft and Yarmouth. These charts together made a striking display in their roofed setting of three walls, covered with green and white bunting, a green and white "London and North Eastern Railway" fascia extending over the breadth of the stand. A model of one of the railway company's covered fish wagons and framed copies of the London and North Eastern Railway map and other announcements relative to the fishing industry completed the display proper which was supplemented by illustrated literature specially prepared for the occasion. The strength of the whole exhibit was in its simplicity.

* * *

On Monday, November 5, at 5.30 p.m., the fourth annual general meeting of the

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Institute of Transport will take place at the lecture theatre of the Institution of Electrical Engineers, Victoria Embankment, London, W.C.2. Following the meeting a paper (to be illustrated with lantern slides) will be read by Mr. T. Salkield on "A Transport Adventure in Persia," descriptive of a pioneer surveying expedition in connection with the proposed trade routes between Quetta in Baluchistan and Meshed in Persia.

* * *

SIR HERBERT WALKER, K.C.B., General Manager, Mr. A. W. Szlumper, C.B.E., Chief Engineer, Major G. S. Szlumper, Docks and Marine Engineer, and Mr. W. Bishop, Solicitor, representing the Southern Railway, have been in conference with a special committee of the Southampton Corporation in regard to developments at Southampton. Sir Herbert Walker, as reported by the *Southern Daily Echo*, explained the proposals of the company in regard to the proposed dock extension on the Western shore, how much Corporation land they wished to acquire, and what compensation they were prepared to make to the town for obtaining facilities for their scheme. In addition to the docks extension the company propose to make a number of important improvements and extensions to the property they own in Southampton, details of which were given by Mr. A. W. Szlumper. The West station is to be enlarged to twice its present size, with large up and down platforms, as well as a big island platform, and four sets of rails. The town or docks station is to be remodelled as a terminus, and the South Western Hotel is to be enlarged by an additional 100 bedrooms and 70 bath rooms, with a proportionate number of public rooms. Among various proposals considered were the construction of a bridge from Shirley Road to the Western Esplanade, a feature of the Western shore scheme. This will remove the inconvenience occasioned by the level crossing at the present West station. These and other proposals will, it is understood, providing that suitable agreements are made with the Southampton Corporation, be covered by a Parliamentary Bill to be deposited in November of the present year.

* * *

WE illustrate on this page the first through train from New Brighton and the Wirral Peninsula to London (Euston). The new service was inaugurated on October 1. The through train leaves New Brighton at 9.58 a.m., calling at West Kirby at 10.28 a.m. and Hooton at 11.8 a.m., and is timed to reach Euston at 3.10 p.m. The return through service leaves Euston at 5.20 p.m., and is due to reach New Brighton at 10.26 p.m. This service, which obviates a change of carriage at Hooton and West Kirby, or, alternatively, travelling to Birkenhead and changing there, is a great boon to passengers journeying to and from the Wirral district.

FIRST THROUGH TRAIN FROM NEW BRIGHTON AND THE WIRRAL PENINSULA TO LONDON (EUSTON).

* * *

Two new cross-channel steamers are on order for the Southern Railway. The vessels are to be 325 ft. long and they will be employed on the Southampton-Havre service.

* * *

AT the October general meeting of the Railway Club, 65, Belgrave Road, S.W.1, an excellent lecture, illustrated by diagrams, was given by Mr. B. Wagenrieder of the L. & N.E.R., his subject being "Railway Rules and Regulations." Mr. Wagenrieder's explanations of the reasons for various rules and regulations, particularly in regard to train working and shunting, were followed with close attention. The lecture was followed by very many questions from the members present, all of which Mr. Wagenrieder dealt with in the confident manner of one who is master of his subject. At the conclusion the lecturer was thanked and complimented by the president, Mr. Cecil J. Allen, and a vote of thanks proposed by the Rev. J. H. Langton Edwards, was carried with loud applause. At the general meeting on Friday evening, November 9, an address is to be given by Mr. F. W. Galton, the Secretary of the Railway Nationalisation Society.

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FELIX J. C. POLE, *General Manager*

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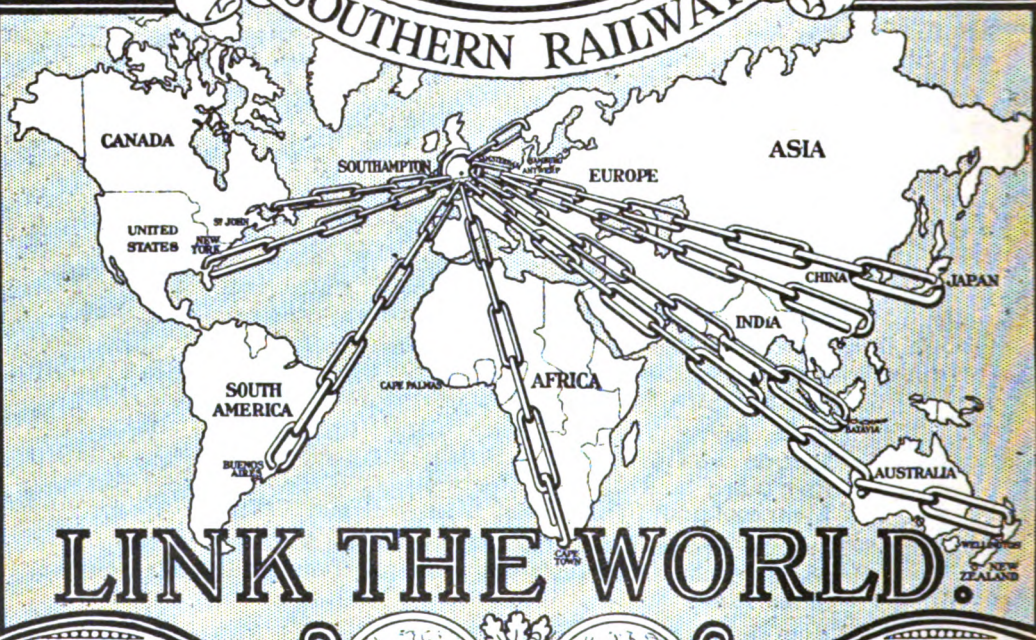

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BOURNEMOUTH	ISLE OF WIGHT	SEAFORD
BUDLEIGH SALTERTON	ILFRACOMBE	SOUTHSEA
BIDEFORD	LITTLEHAMPTON	SWANAGE
BARNSTAPLE	LYME REGIS	SEATON
BUDE	LYNTON	SIDMOUTH
DEAL	MARGATE	TINTAGEL
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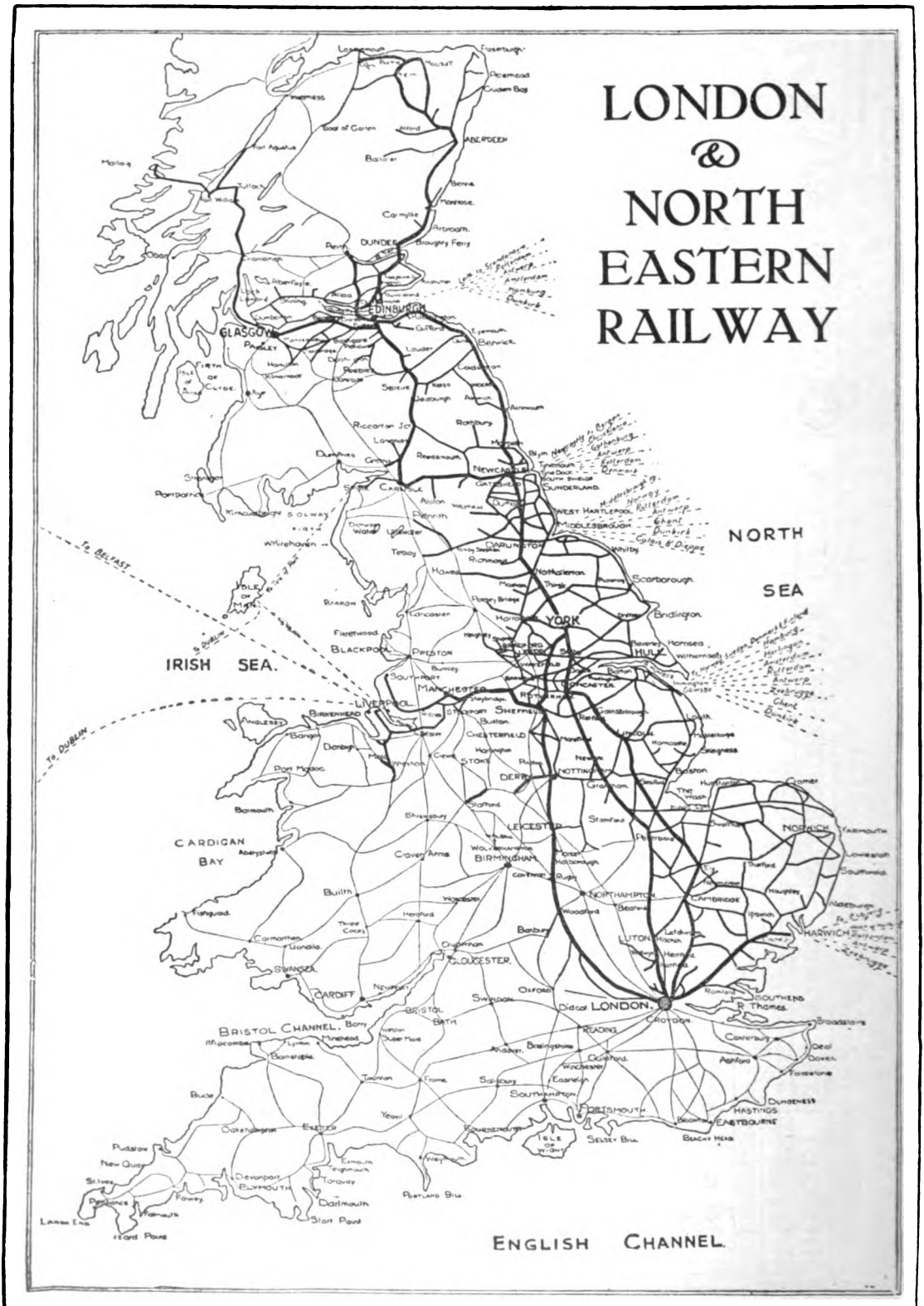

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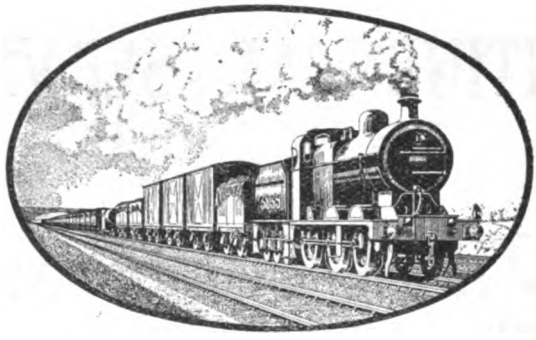

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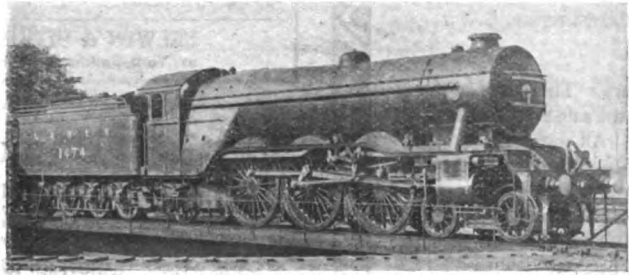

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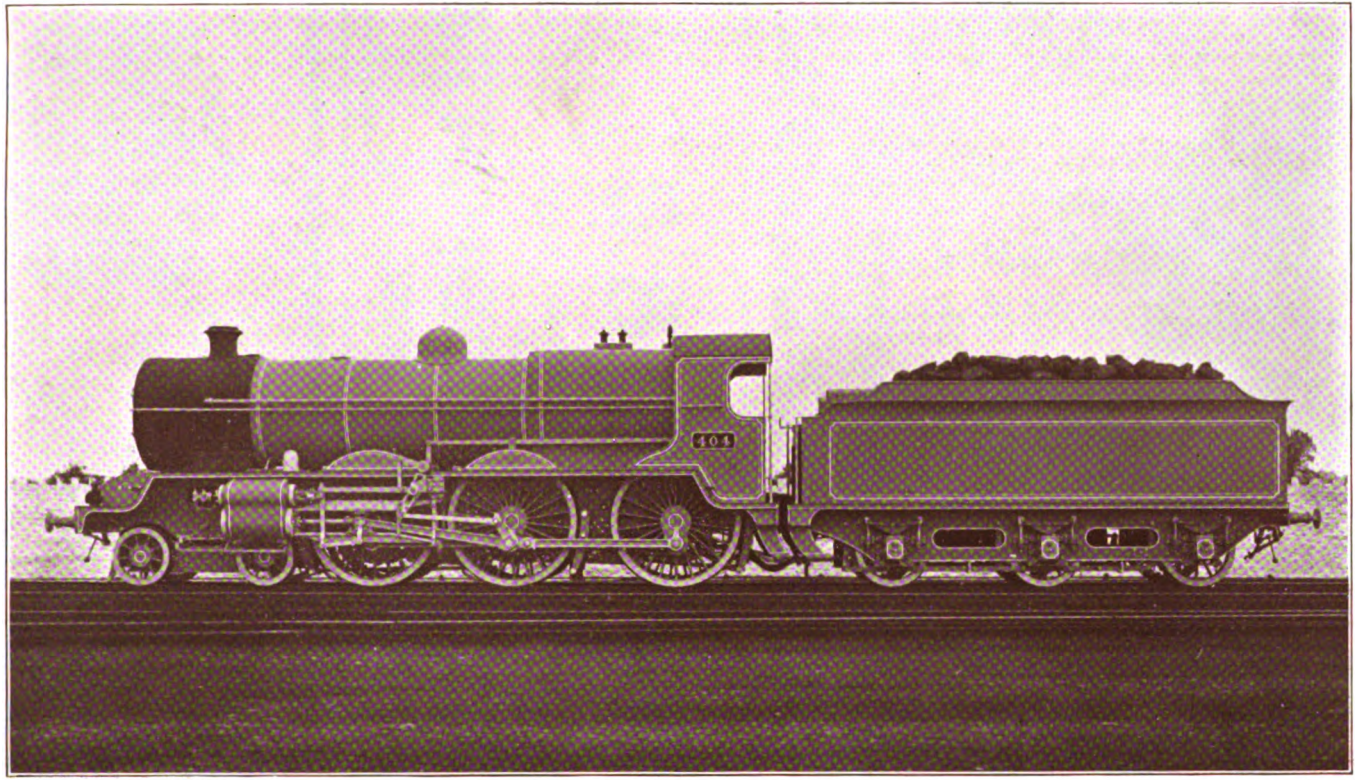

THE RAILWAY MAGAZINE.

NEW FOUR-CYLINDER 4-6-0 LOCOMOTIVE: GREAT SOUTHERN AND WESTERN RAILWAY.

MR. J. R. BAZIN, CHIEF MECHANICAL ENGINEER.

Gauge, 5 ft. 3 in. Cylinders (4), 14 in. × 26 in. Coupled Wheels, 6 ft. 6 in. dia.
Heating Surface—Tubes, 1,614 sq. ft.; Firebox, 158 sq. ft.; Superheater, 366 sq. ft.; Total, 2,138 sq. ft.
Grate area, 28 sq. ft. Steam pressure, 175 lbs. per sq. in. Weight of Engine in working order, 70 tons 14 cwts.
Weight of Engine and Tender in working order, 118 tons 14 cwts

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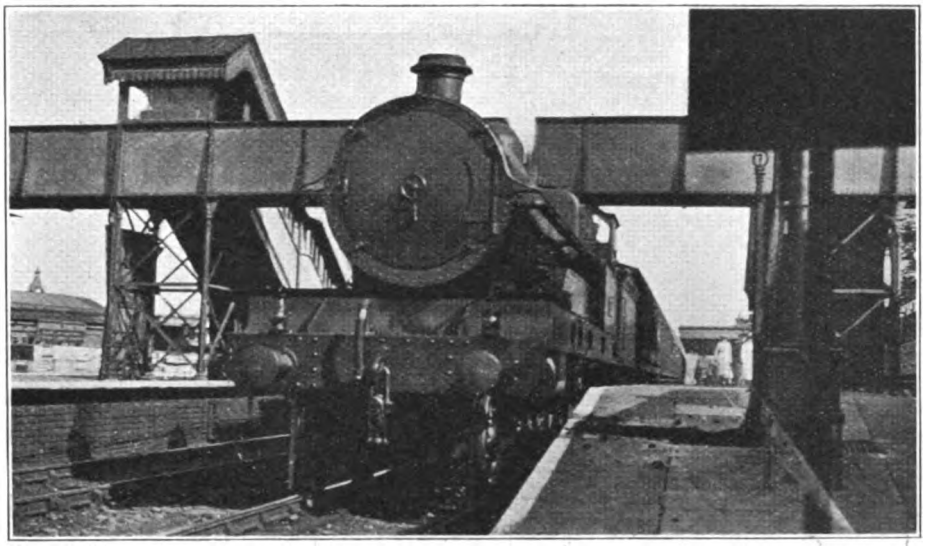

Photo.] DOWN EXPRESS AT MAIN LINE PLATFORM. [*Chas. S. Lake.*

Watford Junction, London Midland & Scottish Railway.

By H. R. STONES.

ALTHOUGH not quite so well known as some of the important junctions on the trunk lines of Great Britain, Watford Junction, situated 17½ miles from London, on the main line of the London Midland and Scottish Railway (Western Division), may be considered worthy of note.

The market town of Watford, situated in the west of the picturesque county of Hertford, has for many years been rapidly developing in size and, to a lesser degree, in industry. This growth has undoubtedly been due to the notable railway facilities provided by the late London and North Western Railway Company, more especially since the electrification of the new line from Queen's Park to Watford in 1917, and the more recent extension of the electric services into Euston, and from Watford to Croxley Green. By the first scheme, a direct connection was made with the "Underground" railways of London, and by the latter, regular through services of electric trains between Watford and Euston and Broad Street, by way of the new line, and a similar electric service between Watford and Croxley Green, were established. Thus the congestion on the main lines south of Watford, caused by the volume of suburban traffic, was considerably diminished.

The early history of Watford in connection with railways dates back from January, 1838, when the London and Birmingham Railway opened the line from London as far as Tring. The building of this line was placed under the direction of that famous engineer, Robert Stephenson. During the construction of the line, the Watford tunnel was built. This necessitated boring through a chalk ridge which lies about a mile north of the present station for a distance of 1,800 yards. The tunnel, now duplicated to carry the fast and slow lines in separate tunnels, is still used, although it has been altered in various respects to suit modern requirements.

The London and Birmingham Railway

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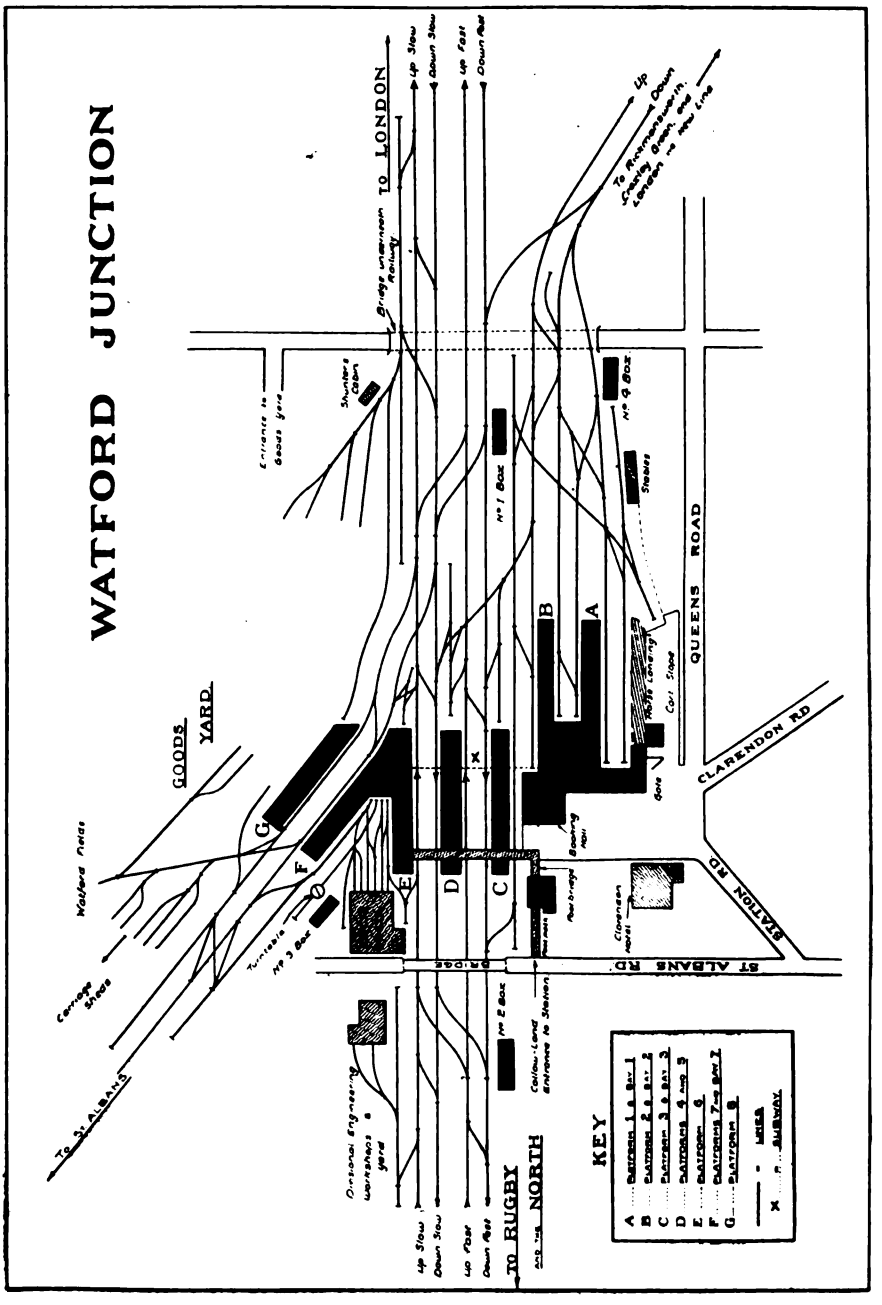

SKETCH PLAN OF PLATFORMS AND CONNECTIONS.

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was finally opened to Birmingham in October, 1838. It is interesting to note that the train service at Watford in that year consisted of six up and six down trains. The mail trains, however, which were naturally the crack trains of the period, did not call, but made a non-stop run from London to Tring, which was considered a great feat in those days. The old London and Birmingham Railway station at Watford no longer exists, and its site is now occupied by the Southern District Engineer's offices and workshops, just north of the present station.

Watford did not become a junction until the year 1858 when, amidst much rejoicing, a small branch line was opened to St. Albans, which up to this time had not been served by a railway. Four years later another branch was opened. This was from Watford to the town of Rickmansworth. The line was the property of Lord Ebury, who operated it for some time under his own supervision. However, in 1881, the London and North Western Railway Company approached Lord Ebury with a view to purchasing this line, which was vested in that company the same year.

Construction of these branches opened up Watford considerably, and in 1872 Parliamentary powers were obtained to lay an additional track between London and Bletchley. To complete this work, the old turnpike bridge, which crossed the original London and Birmingham line near the old station at Watford, had to be destroyed, and a more modern structure was erected in its place, in order to make room for the new track. The result of this scheme was that, in 1879, a regular service of trains was inaugurated between Euston and Watford

Unfortunately the rapid progress of the railway was somewhat marred by a distressing accident, which occurred at Watford in 1883. An engine and some empty carriages were standing on the up line in the station, when an up express ran into them. The engine of the latter was overturned, the driver killed, and 23 other persons more or less seriously injured. This accident seems to have stopped progress for a time, for no further extensions or improvements took place until the year 1907, when the existing lines between Watford and Euston were again widened to cope with the steadily increasing suburban traffic.

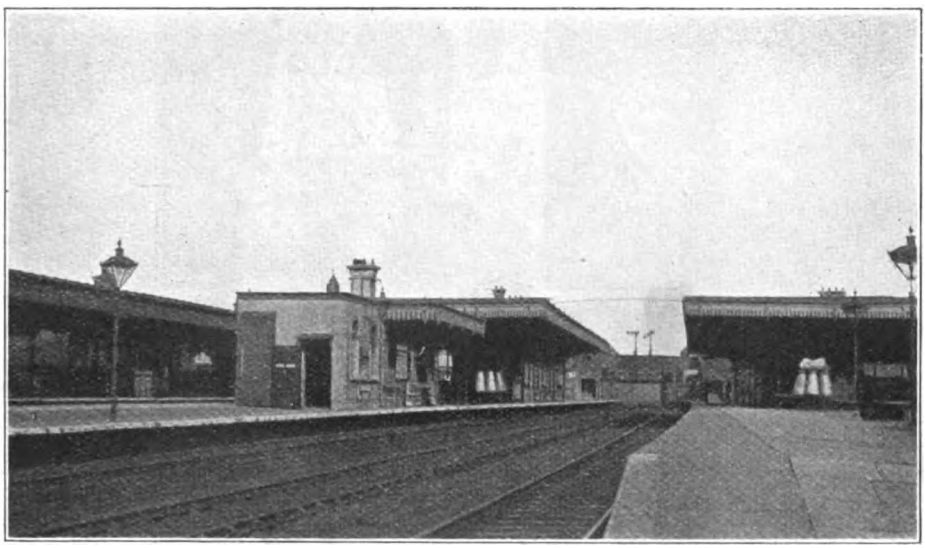

Photo.] SLOW LINES AND LOCAL PLATFORMS. [*Chas. S. Lake.*

In 1912, another branch was opened to Croxley Green, a rising rural district about two miles from Watford. This branch, as stated previously, has now been electrified. The same year the new line from Willesden Junction to Harrow was opened, and shortly afterwards was extended to Watford, where additional

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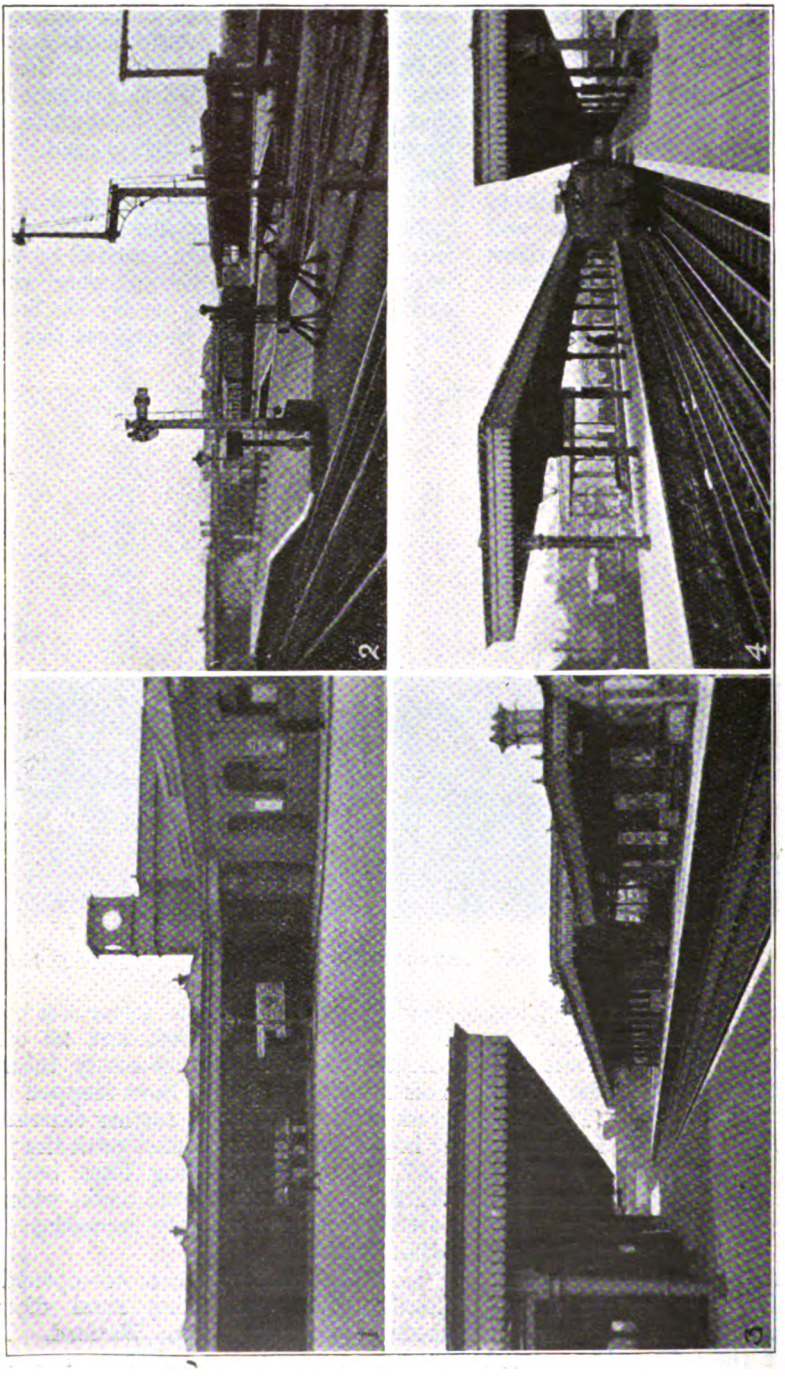

Photos.] [*H. R. Stones.*

1.—General View, Exterior. 2.—General View of Platforms.

3.—Main Line Platforms. 4.—Platforms for Electric Trains.

WATFORD JUNCTION, LONDON MIDLAND & SCOTTISH RAILWAY.

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platforms were erected and several improvements to the existing station building made.

Electrification of the new line was completed in 1917, when the London Electric Railway was granted running powers over the London Midland and Scottish Railway from Queen's Park (West Kilburn) to Watford. Owing to the Great War, the joint rolling-stock for the line could not be delivered, and so up to the year 1918 the through "Bakerloo" trains between London and Watford were composed of "Bakerloo" trailer cars and Central London Railway motors, the latter being originally intended for the Ealing and Shepherd's Bush Railway, not then completed.

The scheme of 1911, which provided for the electrification of the line into Euston, was completed early in July, 1922, and on July 10 of that year the first publicly booked electric trains commenced to run between Watford and Euston, and Watford and Broad Street via Chalk Farm, where vast track alterations and improvements were made, including the construction of fly-over junctions, in order to give the main-line expresses an uninterrupted access to Euston without interfering with the electric suburban traffic to and from the terminus. The inauguration of the electric system into Euston station was fully described and illustrated in the August, 1922, number of the RAILWAY MAGAZINE.

Electrification of the Watford to Croxley Green branch was completed in the middle of 1922.

The present station at Watford Junction is situated on the east side of the town, and can be approached by either the Queens, Clarendon, or Station Roads, which converge on the station approach. The frontage of the station, which is V-shaped in form, is a fairly modern structure surmounted by a clock tower. On one side are the parcels receiving offices, cloak room, and a temperance refreshment room, and on the other side is the main entrance to the station and the booking hall. The hall, although below the level of the platforms, is spacious and well ventilated, and has a well-appointed bookstall facing the booking office.

Photo.] [*Chas. S. Lake.*

EUSTON-WATFORD ELECTRIC TRAIN AT NEW PLATFORM.

Watford Junction possesses eight platforms and four bays. Platforms 1 and 2, which are terminal, and bays 1 and 2 form the new line side of the station, which accommodates the Euston, Broad Street, and Croxley Green electric trains and also the steam motor train operating the Rickmansworth branch. The electric trains to and from Broad Street, however, are only run during the "rush hours,"

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Photo.] [*Chas. S. Lake.*

MR. CROSS,
Stationmaster.

passengers changing at Willesden Junction (New station) into Broad Street trains at other times. The remaining platforms, Nos. 3, 4, 5, 6, 7, 8 and bays 3 and 7 formed the original station previous to the opening of the new line. No. 3 bay, which now accommodates the " Bakerloo " line trains, was formerly used by the Rickmansworth trains, but as stated previously, the motor trains operating on this branch now run into the new line station. Platforms 3, 4, 5 and 6 serve the down and up fast and slow lines respectively, and platforms 7 and 8, and bay 7 serve the trains on the St. Albans branch.

All the branches from Watford, with the exception of the Croxley Green line, are worked by " auto " or " push and pull " trains ; the engines usually employed are small 2-4-2 converted tanks. At the time of writing this article, preparations are being made to electrify the Rickmansworth branch from Croxley Green Junction, and it is hoped to run a frequent electric train service similar to that in operation on the Croxley Green branch.

The traffic at Watford Junction in the morning and evening is exceptionally heavy, as might be expected. On the main lines the average number of trains calling at Watford is 54. On the new line, the " Bakerloo " tube trains in and out average 140, the Euston electric trains average 92, Croxley Green 47, Broad Street 31, while the Rickmansworth motor trains average 28, and the St. Albans line, 47 trains. Stopping trains on the up and down main lines are, for the most part, local trains from Euston to either Tring, Bletchley or Rugby and back. There are, however, several good expresses, booked to call at Watford Junction, including two of the up Birmingham to Euston expresses, the 3.5 p.m. Llandudno to Euston, and on the down side, the 9.30 a.m. Euston to Carlisle.

Watford Junction is controlled by four signal boxes, all under the supervision of the stationmaster. No. 1, which is the largest of the four boxes, with 89 levers and 23 spare, is situated at the south end of the station, and controls all through main-line traffic and the entrance to the goods yard from the south. No. 2, with 54 levers, is situated at the north end, and controls all main-line traffic on the north side, and also one of the entrances to the locomotive sheds. No. 3, with 44 levers, has control of all traffic to and from the St. Albans branch, which, being a single line, is worked under the electric train staff system. A staff instrument is installed in this box. No. 3 box also controls the entrance to the carriage sheds and the other entrances to the locomotive shed and the goods yard. No. 4 box, with 77 levers and 19 spare, has only been opened since the new line was constructed, and has several modern improvements installed, including track circuit interlocking. This box controls all traffic in and out of Watford Junction on the new line, which includes the electric service of the London Midland and Scottish Railway and also the " Bakerloo " tube trains in and out of No. 3 bay.

Mr. E. W. Cross, stationmaster at Watford Junction, has been in the service

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of the London and North Western Railway for 44 years. He joined the company in 1879 at Winslow, and after serving in various capacities at Brondesbury, Buckingham, and Kensal Rise, was appointed Stationmaster at Bricket Wood, on the St. Albans branch, in 1886. In 1889, he became Stationmaster at Verney Junction, and in 1907 was appointed to the responsible position of Night Stationmaster at Willesden Junction. Mr. Cross commenced his present duties at Watford Junction in 1914.

The staff at Watford Junction, under Mr. Cross, consists of over 100 men, including 6 clerks, 3 inspectors, 2 ticket inspectors, 2 platform foremen, 19 signalmen, 10 ticket collectors, 13 porters, 4 parcel porters, 1 porter signalmen, 21 passenger guards, 15 gatemen (employed on the London Midland and Scottish six-car unit electric trains), 2 passenger shunters, 2 yard foremen, 7 shunters, 9 goods guards, 2 motor van men, 2 motor van boys and 9 others.

The Booking and Parcels Department comes under the supervision of Mr. B. Bunker, the Passenger Agent, who has 7 booking clerks and 3 parcels clerks under his charge.

The District Traffic Inspector, Mr. F. W. Sturgeon, whose office is at Watford Junction, commenced his present duties in July, 1920, when a District Traffic Inspector was appointed at Watford for the first time. Mr. Sturgeon's railway career covers some 26 years, in which period he spent 17½ years in various signal boxes in the London area. Previous to his appointment at Watford, Mr. Sturgeon was for eight years the Assistant Traffic Inspector at Willesden Junction. The district under the Watford District Traffic Inspector, extends from North Wembley to Leighton Buzzard on the main lines, which includes Watford, and all the branch lines within that area. Mr. Sturgeon has also charge of the new electrified lines between Watford and North Wembley. The Assistant District Traffic Inspector is Mr. P. H. Smith who previously was in the Trains Office of the District Superintendent at Euston.

Turning to the goods side, Watford is a busy centre, being a marshalling point for the St. Albans, Croxley Green, and Rickmansworth branches. In the case of odd consignments, much transhipment work is performed. There are several large firms in the neighbourhood, including the Planters Products Company, cocoa and chocolate manufacturers, who have a private siding off the St. Albans branch, and the noted breweries belonging to Messrs. Benskin and Sedgewick respectively. The former firm also has a private siding near Watford High Street station, on the new line.

The goods shed, a large stone building with offices adjoining, and the goods yard, are situated on the east of the passenger station. The shed has a single road running through it, and is equipped with three 30-cwt. cranes. In the yard a large 10-ton crane is stationed. The Goods Agent, Mr. A. E. Warner, has a staff of 23 clerks, and 30 outside staff, including foremen, checkers, porters, draymen, numbertakers, cattle loaders, &c.

In conclusion, the writer is much indebted to Mr. Wilfred Steel's history of the L. & N.W. for some of the early history, and to Mr. E. W. Cross, the Stationmaster, and Inspectors Sturgeon, Smith, Horne and others for information kindly supplied.

DISTRICT INSPECTORS STURGEON (left) AND SMITH (right).

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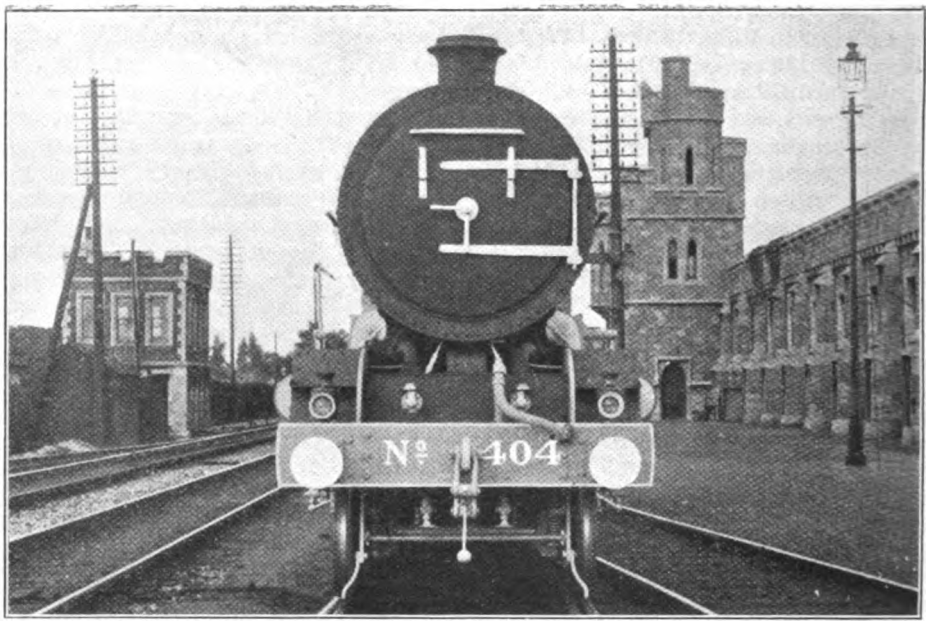

No. 404 OUTSIDE INCHICORE ENGINE SHEDS.

Four-Cylinder 4-6-0 Locomotives, Great Southern and Western Railway of Ireland.

WE are indebted to Mr. J. R. Bazin, Chief Mechanical Engineer, Great Southern and Western Railway, for photographs and particulars of new four-cylinder 4-6-0 locomotives recently placed in service. A general view of one of the class, No. 404, is reproduced as frontispiece, while others show, respectively, No. 404 outside the old and picturesque running shed at Inchicore, and No. 405 hauling the presidential train on the occasion of the official opening, on Monday, October 15, by President Cosgrave, of the new viaduct at Mallow.

The design, generally, is based upon that introduced by the late Mr. E. A. Watson in 1916. A colour plate of No. 400, the initial engine of the class, was given with our September, 1916, number. Three similar engines were subsequently built at Inchicore Works, but while they have all rendered good service, it has not hitherto been practicable to extend the operation of locomotives of this size and capacity. Furthermore, the difficulties of the past few years, including the damage to bridges and viaducts, has restricted still more the use of these heavy locomotives, the destruction of the Mallow Viaduct, in particular, having rendered it necessary to withdraw them entirely from service for the time being. Even now, in fact, although a new viaduct at Mallow is available, over which these engines can pass, they cannot be used between Mallow and Cork, so that it is necessary, until further bridge strengthening and renewal works have been completed, to change engines at Mallow. Usually, the heavier trains are worked between Cork and Mallow by two 0-6-0 goods locomotives, in view of the very severe gradients at that end. Before restrictions had been placed upon their use, however, "400" class locomotives were able to take these gradients unaided, and in due course they will, no doubt, work through to Cork, as soon as the road is able to take them throughout.

Apart from restrictions upon their use, these engines have given general satisfaction, but whereas the original engines, Nos. 400, 401, 402 and 406, were fitted with superheaters, in designing the further series now under construction (which

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includes certain modifications from the original design), it was arranged that of the six new engines which have been constructed by Messrs. Sir W. G. Armstrong, Whitworth & Co. Ltd., at their Scotswood Works, Newcastle-on-Tyne, three should be superheated and three use saturated steam. Nos. 403, 404 and 405 are, therefore, fitted with superheaters of the Inchicore type, while Nos. 407, 408 and 409 are not so equipped.

As will be seen, the outside cylinders drive the middle pair of coupled wheels and the inside cylinders actuate the leading coupled wheels. Leading dimensions are as follows :—

Gauge 5 ft. 3 in.—

Cylinders (4) ..	14 in. by 26 in.
Coupled wheels ..	6 ft. 7 in. diam.
Bogie wheels ..	3 ft. diam.
Coupled wheelbase ..	15 ft. 3 in.
Engine wheelbase ..	27 ft. 1 in.
Grate area	28 sq. ft.

These dimensions apply, of course, to engines of both series. The following apply to the superheater and saturated steam series respectively :—

	Superheater.	*Saturated.*
Steam pressure	175 lb. per sq. in.	200 lb. per sq. in.
Heating surface—		
Tubes ..	1,614 sq. ft.	1,870 sq. ft.
Firebox ..	158 sq. ft.	158 sq. ft.
Superheater	366 sq. ft.	—
Total ..	2,138 sq. ft.	2,028 sq. ft.

	Superheater.	*Saturated.*
Tractive effort at 85 per cent. boiler pressure	19,000 lb.	24,600 lb.
Adhesion weight	55 tons 8 cwt.	—
Weight of engine in working order ..	75 tons 8 cwt.	—
Weight of engine and tender in working order	123 tons 8 cwt.	—

The locomotives recently placed in service differ from the original design in the following particulars :—

Originally the front and middle pairs of coupled wheels were fitted with a set of two spiral springs under each axlebox, the back pair of coupled wheels having laminated springs. This arrangement has been superseded by a laminated spring to each of the coupled wheels, the ends of these springs being in connection with the two compensating levers on each side of the engine. This addition necessitated considerable modification in the brake rigging, which, however, resulted in a rather better gear.

Two four-branch Detroit lubricators for cylinders were originally used. These have been replaced by two three-branch lubricators of similar type. The circulating steam system for cooling the tube elements of the superheater formerly used has been superseded by an air valve. This valve admits the exterior air for cooling the

Photo.] [*Rex Murphy.*

PRESIDENTIAL TRAIN CROSSING THE NEW MALLOW VIADUCT FOR THE OPENING CEREMONY.

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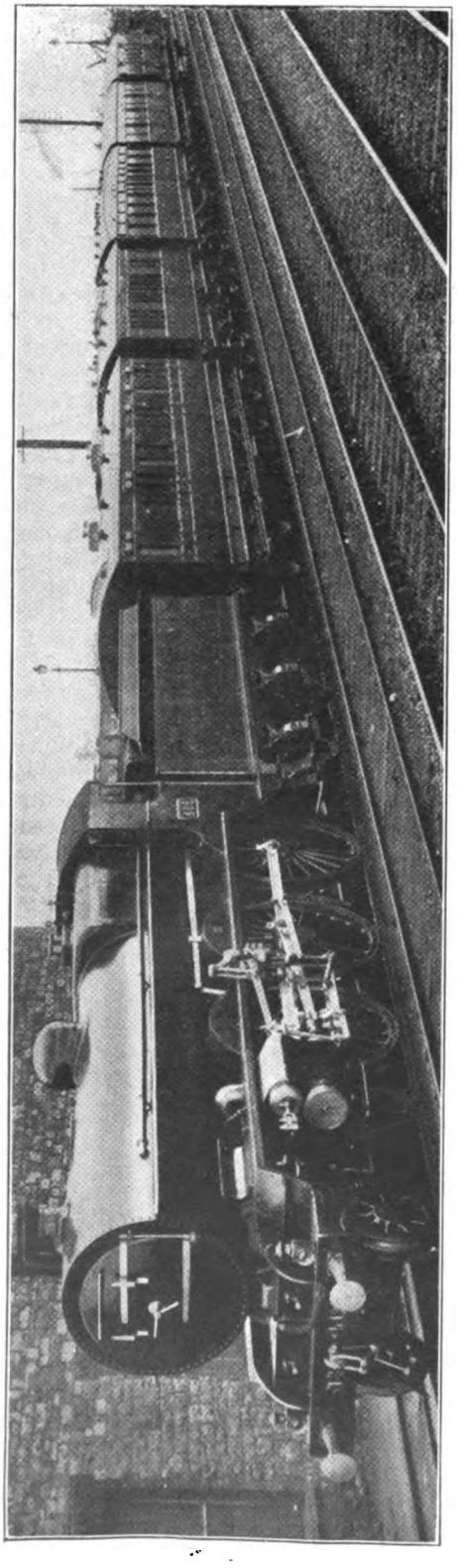

No. 405 ON PRESIDENTIAL TRAIN, FOR THE OPENING OF THE NEW MALLOW VIADUCT.

elements when there is no pressure in the steam pipe.

The boiler has been strengthened in design so as to be suitable for a working pressure of 200 lb. per square inch, although, for the present, the original pressure of 175 lb. is used.

The earlier engines had comparatively small tenders, but those recently built have tenders of a new design, providing increased water and coal capacity. We understand that Nos. 400–2 and 406 will have similar tenders, in place of those previously fitted, in due course. The new tender which has been designed by Mr. Bazin has a water capacity of 4,500 gallons and space for seven tons of coal. It is carried on six wheels, 3 ft. 9 in. in diameter, on a wheelbase of 15 ft. 2 in. In general, the design closely follows that of the usual standard tender, except for increase of capacity, standard constructional details being adopted wherever possible. Both hand and vacuum brake equipment is provided, the latter including Gresham and Craven type brake cylinders. Length over platforms is 24 ft. 9½ in., and total weight in working order 48 tons. All plate surfaces in contact with coal are galvanised. A water level indicator is fitted, while axlebox covers have an auxiliary oiling hole with a swing lid, so that the oiling pad in the bottom of the box can be replenished, if required, during the run without opening the main cover.

As mentioned above, No. 405 was used to haul the presidential train on Monday, October 15, when President Cosgrave was on the engine of the first train to cross the new viaduct at Mallow. The new viaduct replaces the old one destroyed by Republican forces in August, 1922. It includes 10 spans and is of steel girder type. Total length is 515 ft. between abutment. At the opening ceremony the Great Southern and Western Railway was represented by Sir William Goulding, Chairman; Major Henry and Dr. Lombard Murphy, directors; and by the chief officers. Accompanying Mr. Cosgrave were Messrs. Blythe (Minister of Finance), Mulcahy (Minister of Defence), J. J. Walsh (Postmaster-General), and Hayes (Speaker of the Chamber of Deputies). After the presentation to Mr. Cosgrave of an address from the Mallow Urban Council, he and Sir William Goulding took their places on the foot-

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plate and drove the train slowly across the new bridge, the engine severing green, white and yellow ribbons stretched across the track. Subsequently, replying to the toast of his health at a luncheon at Mallow, Mr. Cosgrave congratulated the company on the completion of the new bridge. They had passed through rather abnormal times, but perhaps they could not have seen a better exhibition of normal conditions than in the great engineering work they had inspected that day.

We are indebted to Mr. Bazin for a photograph showing the presidential train on this occasion, while another, supplied by Mr. Rex Murphy, of Cork, shows the train crossing the bridge with President Cosgrave. Mr. Bazin also sends particulars of the return journey made by this special train on October 15, with the five bogie coaches illustrated. No. 405 reached Limerick Junction (37½ miles) in 46 min., start to stop, including two intermediate slacks to 5 m.p.h. and one to 10 m.p.h. Thence to Newbridge (81½ miles) occupied 81 min., this stage including three slacks to 30 m.p.h., one to 10 m.p.h., and one, immediately after the start, to 5 m.p.h. At the same time, on the clear sections very fast running was made, including the 9¼ miles between Maryborough and Portarlington, which were covered at an average estimated at 79·3 m.p.h. The concluding run of 25½ miles from Newbridge to Kingsbridge station, Dublin, were covered in 28 min. The total distance of 144½ miles was covered in a total time of 169½ min., of which 155 min. represented actual running time. The average running speed for the whole journey was, therefore, 55·9 m.p.h.

We are also indebted to Mr. Bazin for particulars of a notable run made by No. 401, an engine built in the year 1921. This engine regularly takes the day mail train, timed to leave Kingsbridge terminus, Dublin, at 7.30 a.m., arriving at Mallow at 11.10 a.m., a distance of 144½ miles. The scheduled time of 3 hours 40 min. for the run includes an allowance of 14 min. for five stops. Net running time is, therefore, 3 hours 26 min. The load throughout the run consists of eleven 8-wheeled bogie vehicles, including vans and dining cars, representing a total weight behind the tender of 363 tons.

On the occasion in question the actual net running time was 3 hours 8 min. The 30 miles from Kingsbridge to Kildare occupied 42 min. 2 sec., the 21 miles thence to Maryborough 23 min. 52 sec., the 15¾ miles onwards to Ballybrophy 22 min. 25 sec., and the 19¾ miles to Thurles were run in 24 min. 5 sec. The 20½ miles from Thurles to Limerick Junction occupied 28 min. 35 sec., while the concluding stage of 37½ miles to Mallow was covered in 47 min. 20 sec. Actual net running time was 3 hours 8 min., a gain of 18 min. upon schedule, there being no excess of time at any of the five intermediate stops. The 144½ miles, with a substantial load, were, therefore, completed at an average of 46 m.p.h., over a route involving heavy gradients and subject to hindrances of an exceptional character.

For instance, owing to the damage done to the route during recent disturbances, speed restrictions to 5 m.p.h. were in force when passing 10 of the under or over bridges; also where hand-flagging was employed at places having signal cabins or telegraphic communications damaged. There were four such sections, aggregating a distance of about 20 miles, worked by flag. On leaving the Kingsbridge terminus, stiff inclines are encountered continuously for four miles, ranging from 1 in 84 to 1 in 169. The negotiation of this long bank without a pilot was a principal objective in the design of this class of engine. From this point to Kildare, a further distance of 26 miles, the climb continues, but moderated to gradients of from 1 in 172 to 1 in 1,143. Speed, exclusive of the station stops, but inclusive of all other delays, as mentioned above, averaged 46 m.p.h. A speed of 80 m.p.h. was attained on a down grade of 1 in 423 at one portion of the road, whilst a maximum speed of 85 m.p.h. was reached on a down grade of 1 in 291. Boiler pressure was well maintained throughout the run, the steaming capacity being good.

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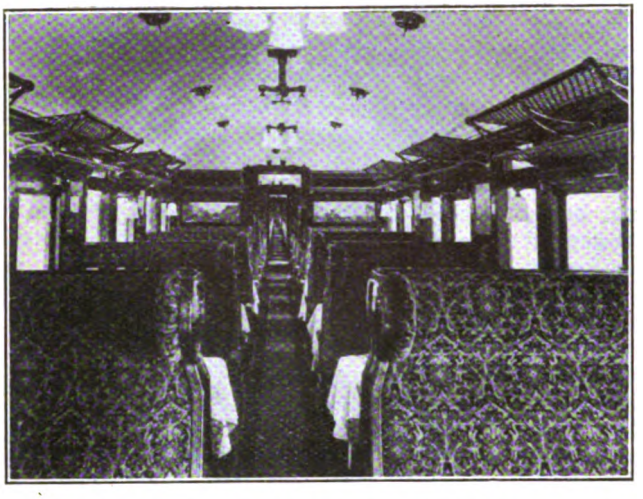

INTERIOR OF NEW VESTIBULED COACH.

Mass . . . Production of Railway . . Carriages. . .

IN the building of railway carriages and wagons there are numerous operations which have been performed hitherto by means of the individual, hand-applied labour of skilled craftsmen, the work absorbing a considerable amount of time, as the vehicles were assembled piece by piece by necessarily somewhat slow and laborious stages. It has for long been realised that a need exists for speeding up methods in railway carriage and wagon shops, and much has been done during the past few years to that end. With this end in view a system has been developed by Mr. R. W. Reid, C.B.E., Carriage and Wagon Superintendent, London Midland and Scottish Railway, based on the use of limit gauges to enable the principles of mass production to be applied to the construction of railway carriages, and has been adopted at the Derby Carriage Works.

Under the old constructional system the approximate time for building a coach, from the laying of the floor until the vehicle was ready to leave the coachbuilding shop, was six weeks, and when it is pointed out that under the new system the time has been reduced to six days, or a saving in time of about 83 per cent., some idea will be gained of the effectiveness with which the system operates. This has been brought about by the adaptation of modern engineering shop methods to carriage building.

In carrying through the reorganisation, one of the first things done was to overhaul the plant in the sawmill so as to render it capable of turning out work of the most accurate kind, and then, in order to obtain the output required, the latest and best woodworking machinery was installed in the mill, and the old appliances scrapped. In the sawmill, under the old system, instead of every piece being marked out, extensive use is made of stop bars and jigs, and only one part is marked out to form a template for the rest. The machine is then set up and the whole of the particular component is put through in one batch. After being machined every piece is sent to the inspection bench, where it is carefully gauged, and by this means every part that leaves the sawmill is rendered interchangeable, so that the bodymaker requires very few hand tools in assembling the coaches.

One of the first difficulties that presented itself when the new process was commenced was that of the shrinkage of timber, it being generally anticipated that trouble would arise therefrom. In practice, however, owing to the fact that the whole of the timber used in railway carriage construction has been carefully seasoned for a number of years, very little shrinkage actually takes place after machining.

A principal difficulty was, therefore, the need for ensuring accurate machining

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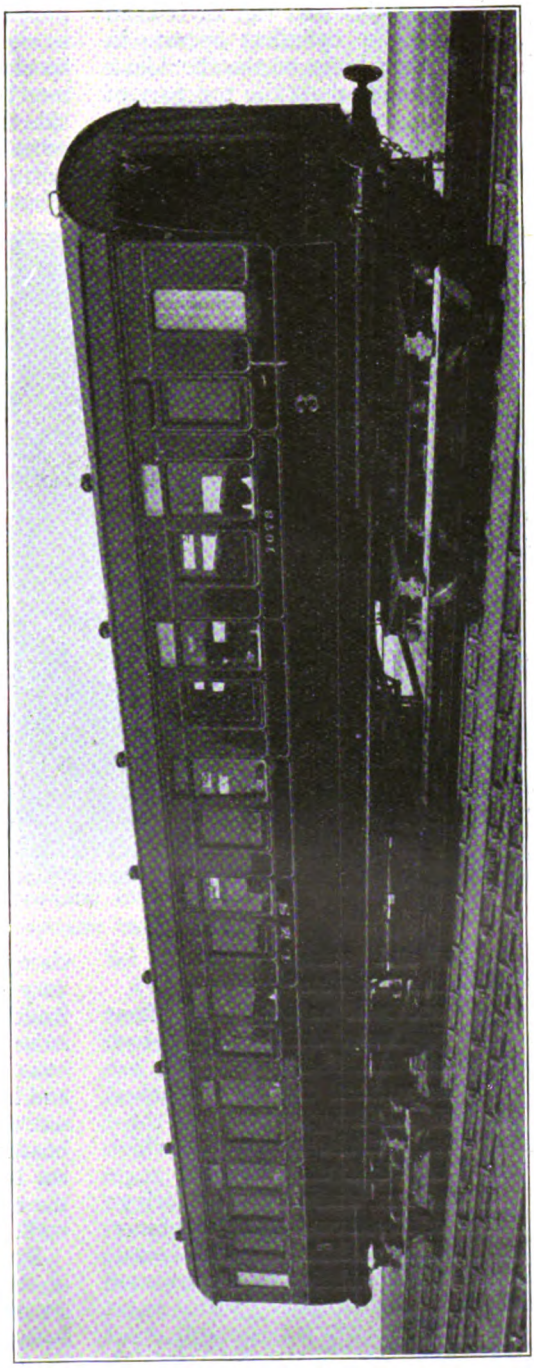
of all members. In view also of the fact that many of the machines, especially those of a special character, require to be set for each job, the design of various parts of railway carriages was carefully considered with the object of making as many of them as possible of the same type, so that larger quantities could be put through the machines at one operation, thus economising labour and setting-up time. In this connection many changes in detail design were made.

After the machining process had been put on a proper footing the next step taken at Derby was the development of the process known as "unit assembly," and in the building of the carriages the work has been sectionalised, so that production of the following parts is going on simultaneously. In the case of compartment carriages the partition boards are all assembled in a jig and the screws to hold the double boards together are driven by means of a magazine-feed screw-driver fixed in a convenient position over the jig. The outside doors are assembled on a locating jig, which has three compressed air cylinders for forcing the tenons into the mortises. Fixed in a convenient position over the jig is a magazine screw-driving machine, and whilst the door is held well up to the shoulders this machine is brought into operation, the necessary screws being driven in. All the doors are made to a definite standard, and are fitted in a standard cast-iron opening. The openings in the carriage are also made to definite standards, and this reduces to a considerable extent the amount of fitting required on doors when they are hung in position on the carriages. The side framing is assembled as a unit and is panelled and moulded up ready for assembly.

In the case of compartment coaches the quarters are assembled on a belt-driven power clamp, this having a screw-driving machine fixed above it, the screws being driven in whilst the tenons are held right up to the shoulders. This machine is



57-FT. THIRD-CLASS VESTIBULED CARRIAGE, BUILT ON MASS PRODUCTION LINES AT DERBY WORKS, LONDON MIDLAND & SCOTTISH RAILWAY.

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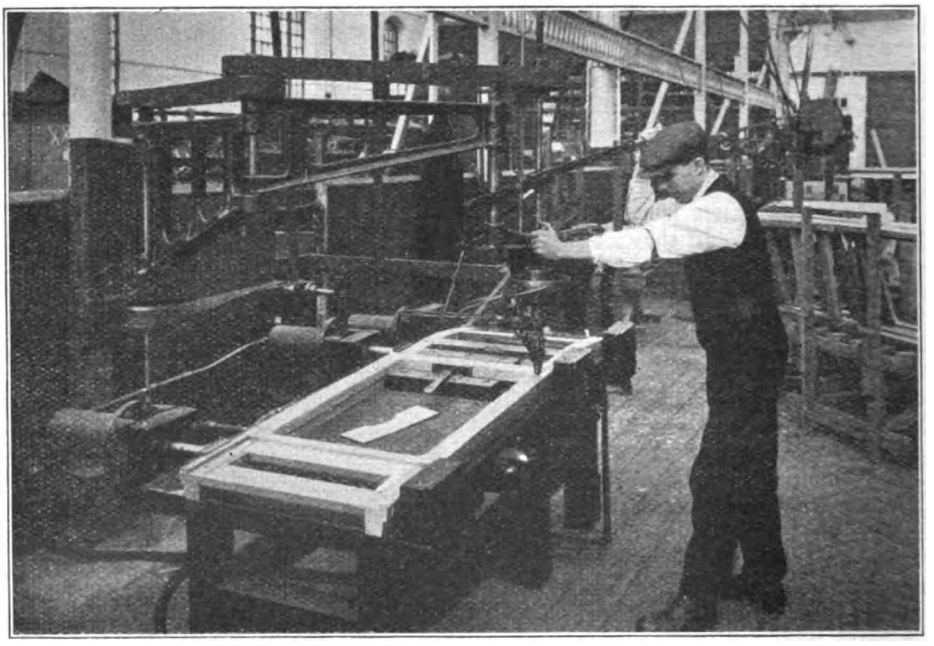
fitted with an automatic squaring device, which ensures the quarter being square when taken up. The ends are assembled on a locating jig, which has six compressed air cylinders. The various parts of the framing that go to make up the ends are dropped into position and the air is then turned on, and the cylinders operate in pushing the tenons home on the shoulders. Two other cylinders push the top part of the end down, and a portable screw-driving machine, travelling on rails, drives the screws into the framing, and then it is so that the bodymaker has little or no fitting to do on them, but simply has to fix them on the quarters.

The main framework, which carries the floor and the sides of the coach, is made on the steel underframe, and the method of procedure is to bolt one bottom side down to one of the solebars, and by means of special clamps the cross-bearers are pulled into the middle bearer; the other bottom side is then put on the frame and a special portable clamp, which runs along both bottom sides, is brought into use. This



CRAMPING AND SCREWING DOORS.

boarded up and moulded ready for assembly in the complete body.

The roofs are built on a jig at the floor level. This jig has a number of cast-iron dummy pillars fixed on it, which are adjustable for various classes of coaches. The cantrail is dropped on to these dummy pillars and the roof sticks, which have previously had the stiffening angle irons put on them, and the screws driven in by means of the screw-driving machines, are then fixed in position, the roof boards are put on, and the whole roof is canvassed up and painted, complete with water strip and cornice ready for assembly. All the panels required are cut dead to size, clamp is fitted with ball bearings and is very easily rolled up and down the full length of the framing. The hand-wheel at each side enables two men to pull the second bottom side on to the cross members and hold it tight up to the shoulders. The screws are then driven in and the floor boards, which are all cut to dead length in the sawmill, are then placed in position, the approximate time taken to put a floor together being one day of eight hours.

By means of this concurrent assembly of the interchangeable parts, it is easy to see how the building time on a carriage body has been reduced at the Derby Works from six weeks to six days. As a matter

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of fact, the actual erection time, namely, from the completion of the floor until the roof is on, is under one hour.

Briefly, the system of erection is as follows: Two erection roads in the shop, capable of holding two 57-ft. carriages, have had platforms laid all the way round so as to render the use of scaffolding unnecessary. The steel underframes mounted on the bogies are brought on to these roads and the floor is laid as previously described. The erection gang then take matters in hand and proceed to put the ends of the coach up, these, as previously explained, being pulled down into the end boards by means of portable compressed air cylinders, which latter are run under the underframes. Special tie-rods are fixed at the top of the coach end, these reaching down to a point convenient for the application of the compressed-air appliance, and when the air is turned on the whole end piece is pulled right home on to the shoulders of the tenons. The sides are then erected in a similar manner, but the actual pulling home of the tenons on to their shoulders is done by means of simple racks and levers operated by hand on the "jack" principle, this being a sufficiently expeditious and inexpensive method of forcing the sides into their proper positions.

After the sides have been erected the roof is lifted off the jig, and, by means of two small hand cranes, which run the full length of the two erecting lines, it is dropped on to the top of the ends and the sides. The necessity for accuracy will be appreciated at this point when it is mentioned that the roof cantrails have no fewer than 90 mortises in them, these being required to register with 90 corresponding tenons on the side framing.

MAKING CARRIAGE END FRAMES.

After the roof is dropped into position and located, power clamps are applied to the inside of the cantrails, and the whole roof is then pulled down home on to the shoulders of the tenons and the side framing. As previously mentioned, the actual time taken in the work of erection is roughly one hour. After the roof has been pulled down on to the tenon shoulders the pressed steel brackets are bolted down and the bottom quarter panels are put on, the vehicle being then ready to leave the erection road, the next step being the application of the casing boards and the three-ply covering of the interior roof.

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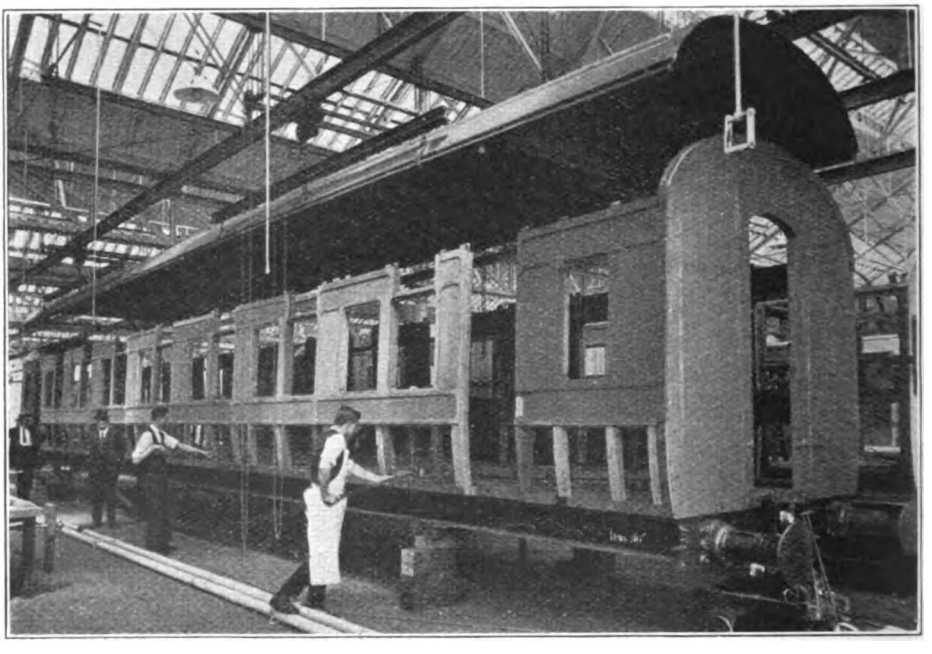
All the tools and jigs used both in the machining operations and in the assembly have been designed and made at the carriage and wagon department at Derby.

The rapid assembly of the interior finishing of the coaches is a very much easier proposition than the assembly of the carriage body itself, as most of it is of a rectangular design, and this, as will be readily appreciated, means very much easier machining work. All the gangway doors are glued up and assembled in a jig, without any handwork being done on them. The accuracy of the work can be seen by examining any of the carriages that have been assembled by this method, when all shoulders will be found perfectly square and the workmanship throughout of a very high order. The door lights, photo frames, &c., are also assembled on jigs, and with an equally high standard of rapidity in production.

By courtesy of Mr. Reid, we are able to include with this description of the methods introduced at Derby Works several illustrations showing work in progress.

Among vehicles constructed on this system may be mentioned a new type of vestibuled central-gangway carriage, of which 60 are being constructed as a first order. Length over body is 57 ft., and width 9 ft. 1½ in. as a maximum. Each bogie has a wheelbase of 9 ft., and the distance between the bogie centres is 40 ft. 6 in. Third-class cars have a seating capacity for 56 passengers, and, in the case of the composite vehicles, 12 first and 35 third-class passengers. Weight of the vehicle is 27 tons. The carriages are divided in the centre by partitions and a sliding door, thus forming smoking and non-smoking compartments, and special attention has been given to the provision of ample luggage accommodation. The doors at either end of the car open into vestibules, in which are large racks for heavier luggage and also a compact lavatory fitted up with hot and cold water to the wash-basin. In addition to the luggage racks at each end, the cars have double net racks. By fitting special types of steam radiators close up to the sides of the cars, covered with pierced brass guards, the designers have been able to provide a large amount of space beneath the seats for storing suit cases and similar baggage.

Owing to the limitations of the loading



CRAMPING FRAMING IN POSITION.

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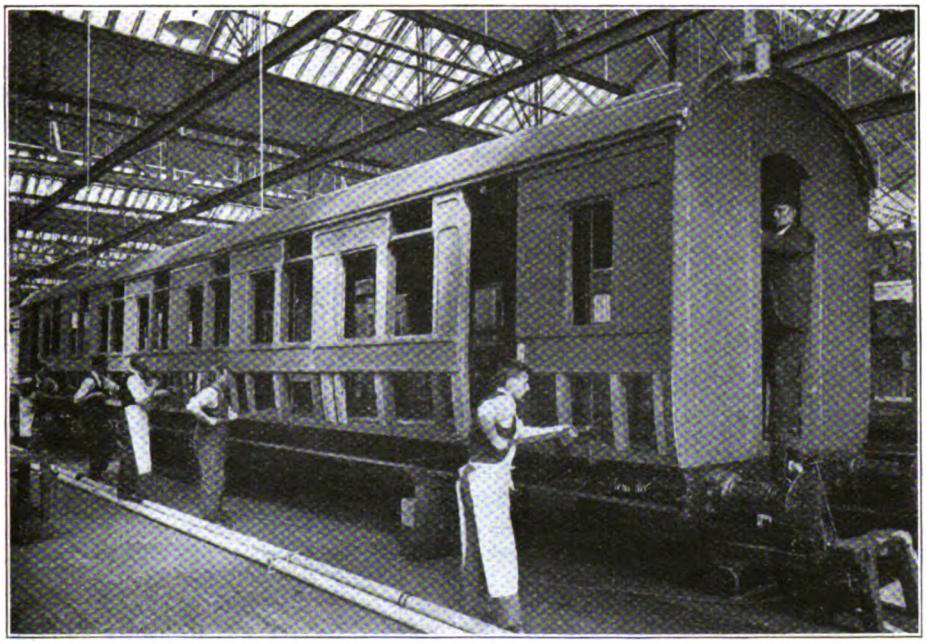
gauge, the overall width of railway cars is restricted, and in these new carriages the problem of providing comfortable seating space for passengers and a sufficiently wide gangway or corridor has been overcome in rather an ingenious way. The ends of the seats have been so arranged that there is considerably more width at the top, that is where the elbows of anyone passing would catch the seating, and the gangway is narrowed at the seat level to give the necessary seating space without interfering with the space available for passengers walking through the gangway.

Between each pair of seats is fixed a table, and over the table a reading lamp with a switch under the control of the passenger has been arranged, also a push-button to call the attendant. In addition to the reading lamps, electroliers of simple and effective design are carried from the semi-elliptical roof, which is enamelled white and in itself forms an excellent reflector. The lighting in the carriages has been so arranged that it is impossible for a passenger wherever seated to get the glare of the lamp filament in his eyes.

The interiors of the cars are finished in mahogany, and in the upholstering some different patterns of material have been used with very pleasing effect. The standard black and red is still fitted in some of the cars, and this material has many points to recommend it, but the introduction of fawn and blue moquettes certainly improves the appearance of the cars. The double floor of the carriage, which is insulated with felt against sound, is covered with heavy linoleum of brown colour, a carpet being laid down the centre corridor.



COMPLETING BODY WORK.

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Locomotive and Train Working in the latter part of the 19th Century.

MIDLAND AND SOUTH WESTERN JUNCTION RAILWAY. [No. II.]

By E. L. AHRONS, M.I.Mech.E., M.I.Loco.E.

IT was not until 1893 that the company ventured on a new locomotive, which took the form of a 4-4-0 passenger tender engine for the through trains. This was No. 9, built by Messrs. Dubs & Co., having 17 in. by 24 in. cylinders and 6 ft. wheels. For a long time it was stationed at Andover and worked a stopping train through to Cheltenham, returning in the afternoon at 2.52 p.m. with a fast train for Southampton, which connected at Cheltenham with a Midland express from the north.

The following year (1894) Messrs. Dubs built three more passenger tender engines, Nos. 10, 11 and 12, having cylinders of the same size as No. 9, but coupled wheels of a diameter of 5 ft. 6 in. only. But these three engines were of the 2-4-0 type without bogies. Possibly bogies were too much of an expense, though it must be added that they are eminently adapted to this railway, on which some of the curves, especially between Andoversford and Marlborough, are by no means easy. These engines carried 150 lb. pressure, and No. 10 was usually stationed at Cheltenham to run through to Andover with the 10.27 a.m. fast train, returning thence with the 3 p.m. express.

The best expresses each way were through trains to Southampton, and, as mentioned previously, connected with the fastest Midland trains at Cheltenham. I do not know the exact date when they first made their appearance, but they were certainly running in 1896, and either then or very shortly afterwards one of them in each direction conveyed a through Midland carriage between Bradford and Southampton. Considering that the line at that time was "single" almost throughout, so that the tablet had to be changed, and that the gradients over various sections are very heavy, the running was very creditable to the company. The 2.52 p.m. from Cheltenham reached Andover at 5.10 p.m., with stops at Cirencester, Swindon, Marlborough and Savernake. Its best speed was the 16¼ mile run from Savernake to Andover at 37·5 m.p.h., which, by the way, was the fastest on the line. From Cirencester to Swindon it averaged 33·2 m.p.h. for the 15 miles.

The 3 p.m. corresponding express from Andover in the opposite direction reached Cheltenham at 5.13 p.m., its best speeds being 34·6 m.p.h. from Swindon to Cirencester, and 33·6 from Andover to Savernake.

In 1894 two goods side tank engines, Nos. 4 and 13, were built by Dubs & Co., having 4 ft. 7 in. wheels and 17 in. by 24 in. cylinders, and in 1895-96 two "Mogul" or 2-6-0 goods tender engines with 4 ft. coupled wheels and 18 in. by 26 in. cylinders came from the works of Beyer, Peacock & Co. These had outside cylinders, and were the only "Moguls" then at work in this country, for those of the Great Eastern Railway had then been broken up. The above four engines were the first attempt of the company to cater specially for through main line goods traffic. The two tank engines were usually stationed at Swindon, but of the Moguls No. 14 was at Cheltenham and No. 16 at Andover, to run the through goods with traffic between the Midland line and Southampton.

A 0-4-4 bogie side tank engine was delivered in 1895 by Beyer, Peacock & Co., having 5 ft. 2 in. wheels and 17 in. by 24 in. cylinders. This engine was generally to be found on the central sections, Swindon-Cirencester, and Swindon-Chiseldon and Marlborough.

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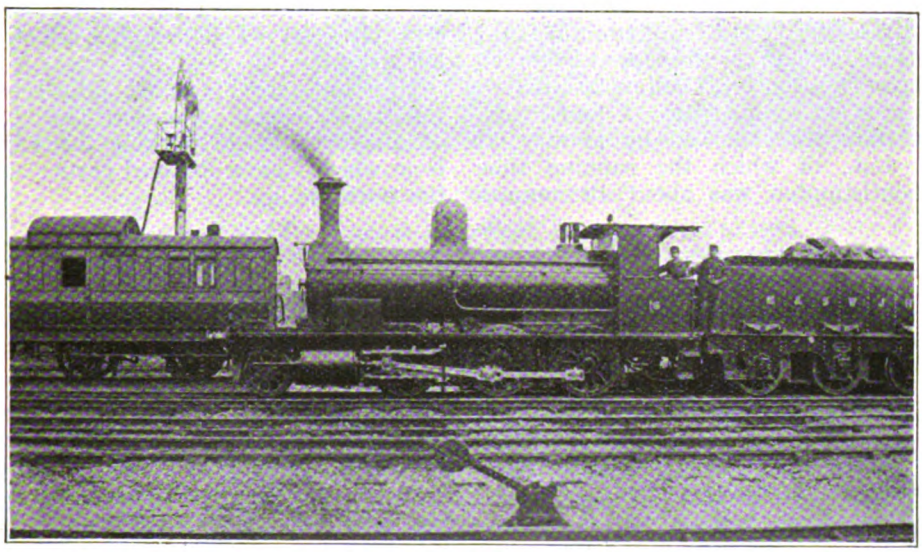
Two other passenger trains deserve mention. These were the special mails, which ran on Saturdays only, one in each direction between Southampton and Cheltenham, in connection with South African and American steamers. The train left Southampton at 9 p.m., Andover at 10.10 p.m., and arrived at Cheltenham at 12.38 a.m. The train from Cheltenham departed at 6 a.m., arrived at Andover at 8.16 a.m., and Southampton at 9.5 a.m. These trains at that time were generally worked by the 2-4-0 engines 10, 11 and 12.

Two very handsome main line tank engines, Nos. 17 and 18, of the 4-4-4 type, with inside cylinders, arrived in 1897 from the works of Sharp, Stewart & Co. Ltd. These have driving wheels 5 ft. 3 in. diam., bogie wheels 3 ft. diam., and cylinders 17 in. by 24 in. The total wheel base is 31 ft. 7½ in., and the boiler is pressed at 160 lb. per sq. in. Both of these engines were stationed at Cheltenham for some time after they were built.

Reference has been made to the inconvenience caused in running over the Great Western single line branch between Marlborough South Junction and Savernake, and therefore the Midland and South Western Junction Railway decided to have a line of its own, to avoid the Great Western. Owing to financial causes, this new line was constructed by "The Marlborough and Grafton Railway Company," which consisted chiefly of the same people as the Midland and South Western Company "camouflaged" to look like another lot. This was a double line, and was opened in June, 1898, whilst at the same time the old line between Savernake and Grafton was also doubled. A further advantage of the new line lies in the fact that the gradients are more favourable than those of the old Great Western branch. The time allowance between Marlborough and Savernake was reduced from 12 to 9 minutes, though I should mention that one train in 1896 was booked to run between these stations over the G.W.R. branch in 10 minutes, though it probably frequently exceeded it.



2-6-0 GOODS LOCOMOTIVE, No. 16.

Built by Beyer, Peacock & Co., 1897.
Coupled Wheels, 4 ft. diam. Cylinders, 18 in. by 26 in.

In the early days of the company Ludgershall was an unimportant countryside station of no particular importance, but during the 'nineties the War Office formed a large military camp on that portion of Salisbury Plain which adjoins it, and the conveyance of troop trains became one of the important sources of

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traffic. To cope with these trains, and also with the increasingly important through goods traffic between the Midland Railway and Southampton, six 0-6-0 express goods engines were built by Beyer, Peacock & Co. in 1899 (Nos. 19 to 24). Four more of the same class followed in 1902. The coupled wheels have a diameter of 5 ft. 2½ in., the cylinders 18 in. by 26 in., and the boiler pressure 160 lb. The heating surface is somewhat on the small side, being only 1,079 sq. ft.

These engines ran through between Cheltenham, where several of them were stationed, to Southampton at really excellent speeds. For instance, the 3 a.m. through goods from Cheltenham (High Street) arrived at Southampton (97¼ miles) at 7.20 a.m., with stops at Swindon, Andover and Romsey, totalling 20 minutes, having a net running time of four hours. This train was followed by another at 4.45 a.m., of which the running time to Southampton was about 10 minutes longer. The 9.30 p.m. in the opposite direction from Southampton reached Cheltenham (passenger) at 1.40 a.m., with stoppages totalling 20 minutes, so that the running time was only 3 hr. 50 min. The above performances were excellent over a " single " line for the greater part of the distance.

The development of the Midland and South Western Junction from an impecunious " backwoods " railway into a progressive and enterprising concern was really a great achievement, and appears specially so to those who knew and travelled over the line in its infantile days. The northern connection with the Midland was certainly the making of the railway, which certainly deserved success after a long uphill struggle.

My thanks are due to Mr. John Davies, the late General Manager, for copies of some of the old working time-tables, from which I have obtained particulars of the train timings.

A LONDON & NORTH WESTERN LOCOMOTIVE ON MIDLAND DUTY.

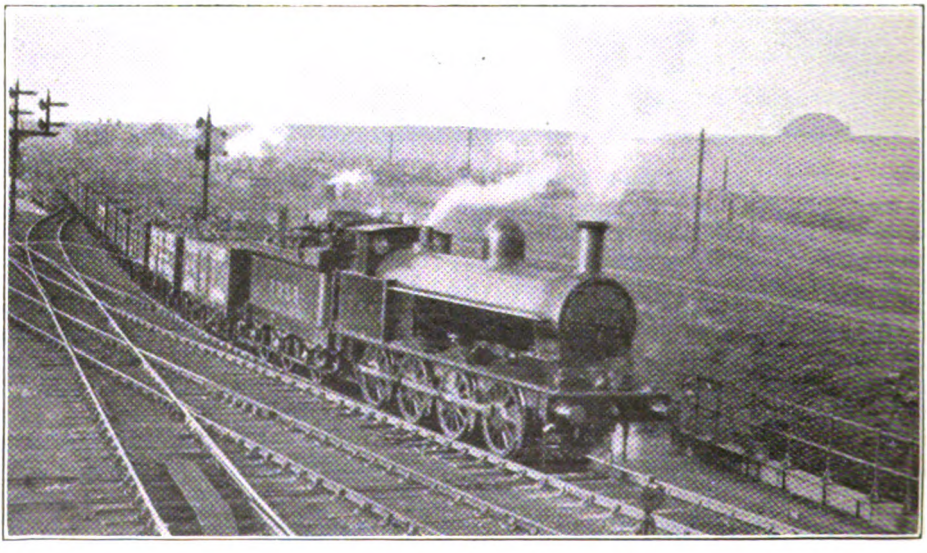

Photo.] [*G. A. Beckton.*

London & North Western 0-8-0 engine, with new numbering and lettering, leaving Toton sidings, Midland Division, London Midland & Scottish Railway.

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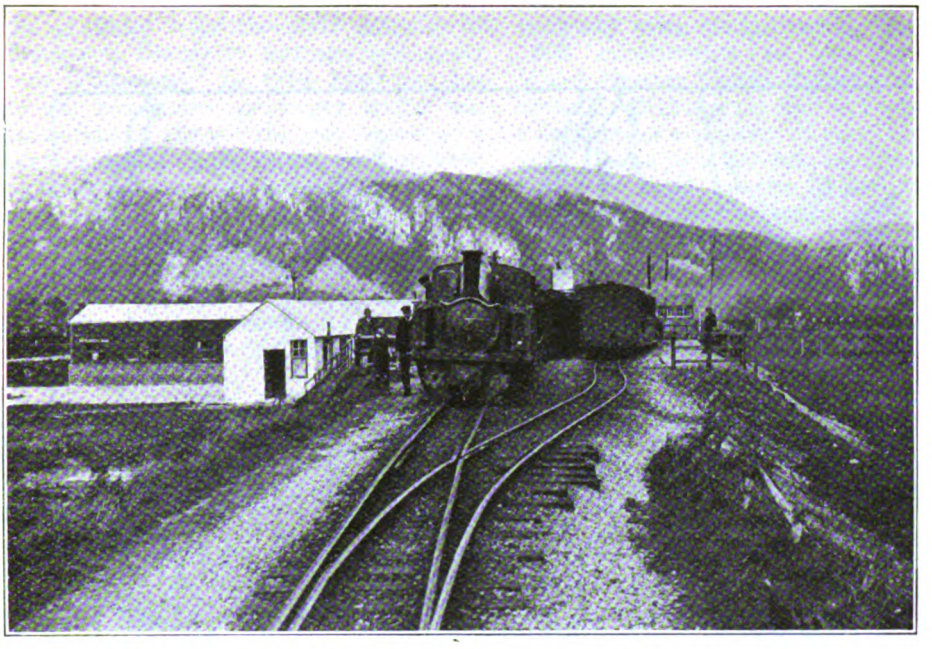

PORTMADOC (NEW) STATION.

Festiniog Railway Train to left; Welsh Highland Train to right.

The Welsh Highland Railway.

THERE are not many British railways using the gauge of 1 ft. 11½ in., but most of those which are in operation possess features of special interest and have rendered good service in developing traffic, both passenger and goods, in districts having notable scenic attractions. Thus, the Lynton and Barnstaple is in great favour with tourists, while it has done much to open up some of the most beautiful districts of the south-west, and the Vale of Rheidol line and the historic Festiniog have given rail access to some of the most interesting of the mountainous regions of Wales. To these is now added the Welsh Highland Railway, incorporating the North Wales Narrow Gauge Railway (opened 1877 and 1881) and various other lines which had not been brought into use for public traffic and portions only of which had been completed until taken in hand by the Welsh Highland Railway Company.

The North Wales Narrow Gauge Railway was very fully described by Mr. H. L. Hopwood in the July, 1917, number of the RAILWAY MAGAZINE. This line extended from Dinas Junction, a station on the Carnarvon-Afon Wen section of the then London and North Western Railway, to Rhyd-ddu, at the base of Snowdon, and until the opening of the Snowdon Mountain Tramroad from Llanberis, in 1896, the nearest station to Mount Snowdon. There was also a branch from Tryfan Junction to Bryngwyn, bringing the total mileage to 12 miles 34 chains.

This line was opened from Dinas Junction to the west end of Quellyn Lake, with the Bryngwyn branch, in June, 1877, and for passenger traffic in the following August, while the extension to Rhyd-ddu (now South Snowdon) was brought into use in May, 1885. In that year powers were obtained for an extension to Carnarvon Harbour, but these have since lapsed, though in another form this extension is a probable development of the near future. The North Wales Narrow Gauge Railway for many years carried considerable passenger traffic during the tourist season, and conveyed large quanti-

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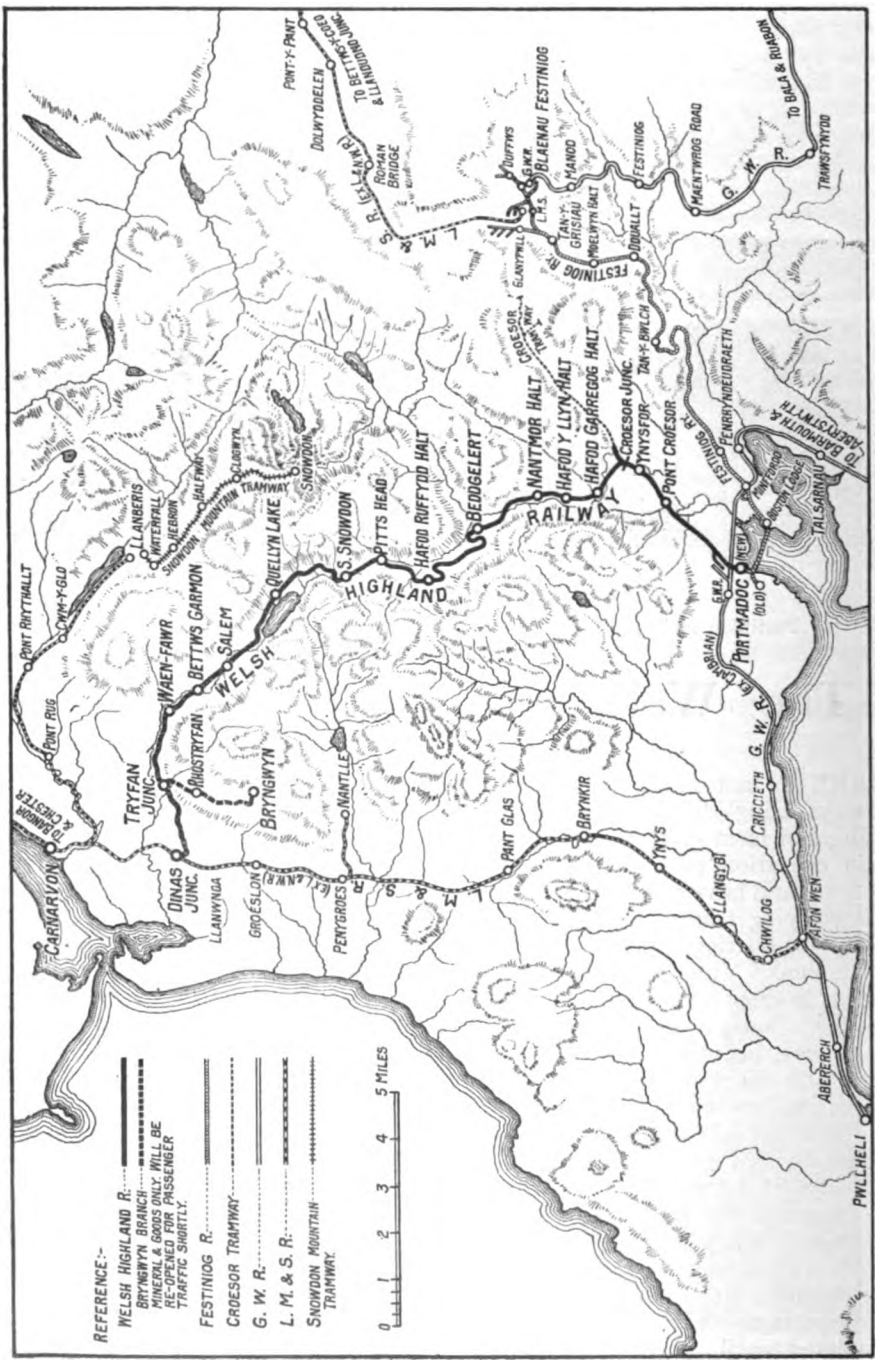

MAP OF WELSH HIGHLAND, FESTINIOG AND OTHER RAILWAYS IN THE DISTRICT.

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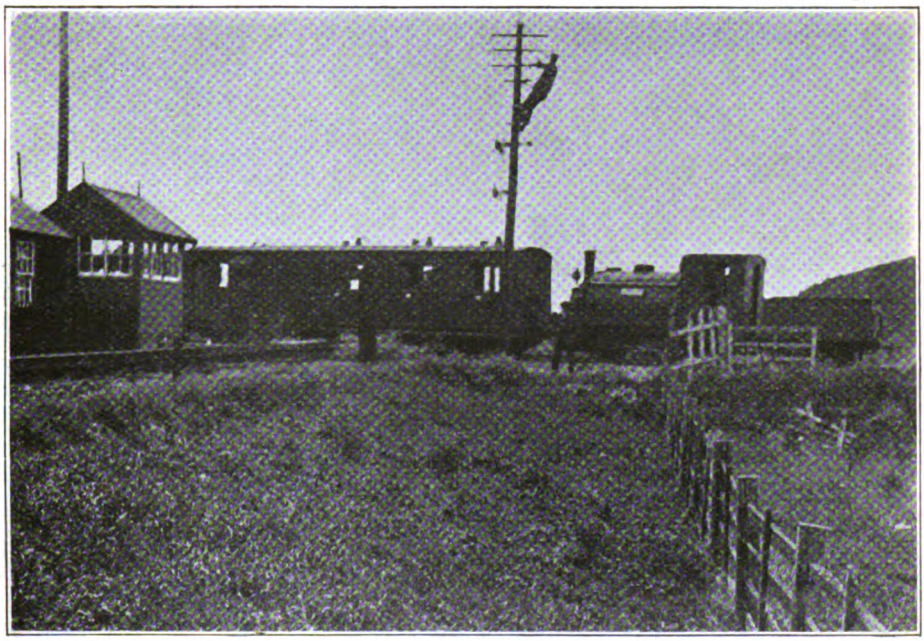
ties of slates from the slate quarries at Bryngwyn, though its fortunes were never very prosperous. In 1916, however, due to war conditions, passenger traffic was discontinued, though the line conveyed a fair amount of goods traffic, and rendered good service for the transport of timber, as it gave access to several areas where the Forestry Corps were established.

It had been realised that if the line was to justify itself fully, it must reach the favourite holiday resort of Beddgelert, and so the Portmadoc, Beddgelert and South Snowdon Railway Company was constituted. This incorporated the Croesor-Portmadoc Railway, dating back to 1860, a horse tramway connecting Portmadoc with the slate quarries of the Croesor Valley. The Croesor-Portmadoc Railway became known as the Portmadoc, Beddgelert and South Snowdon Railway under an Act of 1904, and by Light Railway Orders of 1906 and 1908 it was given authority to take over some of the lapsed powers—for extensions south of Rhyd-ddu to Beddgelert—of the North Wales Narrow Gauge Railway. Portions of the Croesor tramway were reconstructed, and, about 1900, construction to join the North Wales Narrow Gauge Railway was commenced. Not a great deal was done, however, and for a number of years the works were almost in a derelict condition, until taken in hand by the Welsh Highland Railway Company, constituted under the Welsh Highland Railway (Light Railway) Order of 1922.

This Order of the Light Railway Commissioners transferred to the new railway the powers of the North Wales Narrow Gauge and Portmadoc, Beddgelert and South Snowdon Railways as far as they related to railways between Portmadoc and Carnarvon. The survey for the new railway was commenced by Sir Douglas Fox and Partners in January, 1922. The contract for the work was let to Sir Robert McAlpine and Sons and work was started in March of the same year. The contract included the reconditioning of the North Wales Narrow Gauge Railway and this work was undertaken first. The section from Dinas Junction to South Snowdon was completed and reopened for passenger



WELSH HIGHLAND TRAIN ENTERING PORTMADOC (NEW) STATION.

Crossing Great Western Railway on the level.

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traffic on July 31, 1922. Work was meanwhile begun on the new portion from South Snowdon to Portmadoc, and this was completed and opened for passenger traffic on June 1, 1923.

The authorised capital of the railway is £120,000 in 120,000 shares of £1 each. Powers are also given to borrow an equal amount on mortgage, the amount of debentures not to exceed, at any time, the share capital actually subscribed and issued. Of the share capital £90,000 is allotted and issued as fully paid partly have also subscribed the following amounts :—

	£
The Carnarvonshire County Council	15,000
The Gwyrfai Rural District Council (of which £2,000 is allocated to the railway between Dinas and Carnarvon)	5,000
The Glaslyn Rural District Council	3,000
The Deudreath Rural District Council	3,000
The Portmadoc Urban District Council	5,000

These local authorities have the power to appoint a director to the board of the

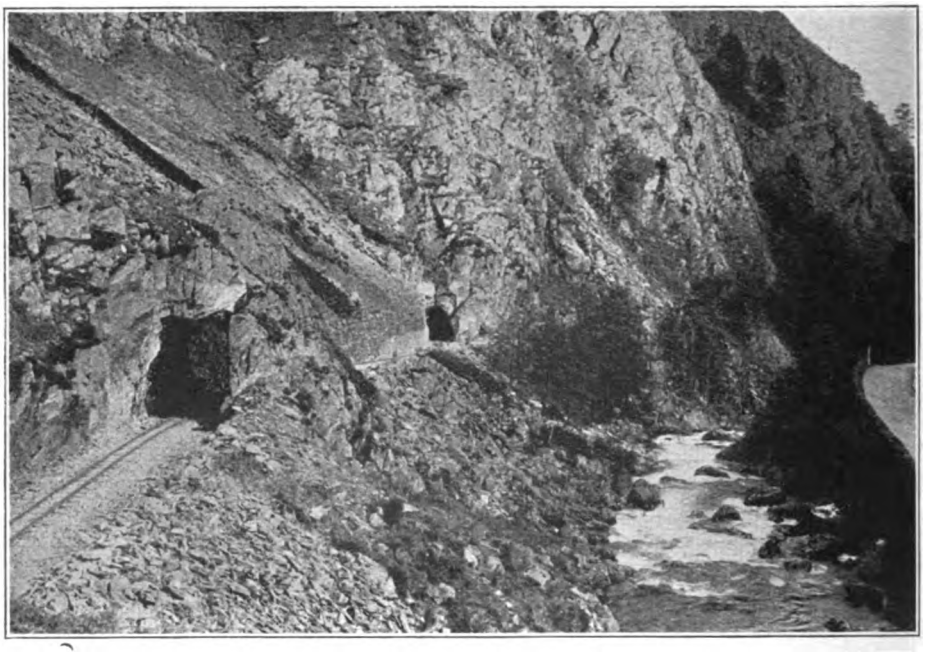

Photo.] [*J. K. Prendergast.*

GENERAL VIEW OF TUNNELS IN THE PASS OF ABERGLASLYN.

to the North Wales Narrow Gauge Railway and partly to the Portmadoc, Beddgelert and South Snowdon Railway as purchase money for those railways in the following proportions: £40,000 to the North Wales Narrow Gauge Railway and £50,000 to the Portmadoc, Beddgelert and South Snowdon Railway.

The Government has subscribed an amount to the debenture stock of the company equal to half the cost of completing the railway from Portmadoc to Dinas, provided that the sum so advanced shall not exceed £37,500. The local authorities company. Mr. M. E. Nee now acts in this capacity. The board is as follows: Chairman: Mr. H. J. Jack. Directors: Mr. E. R. Davies, Sir J. Stewart, Bart., and Mr. M. E. Nee. The same board, with the exception of the last named, also control the Festiniog Railway and the Snowdon Mountain Tramway and Hotels Company, and have many other interests in the locality.

In view of the fact that the Festiniog Railway, which, it will be remembered, has been exempted from the grouping provisions of the Railways Act of

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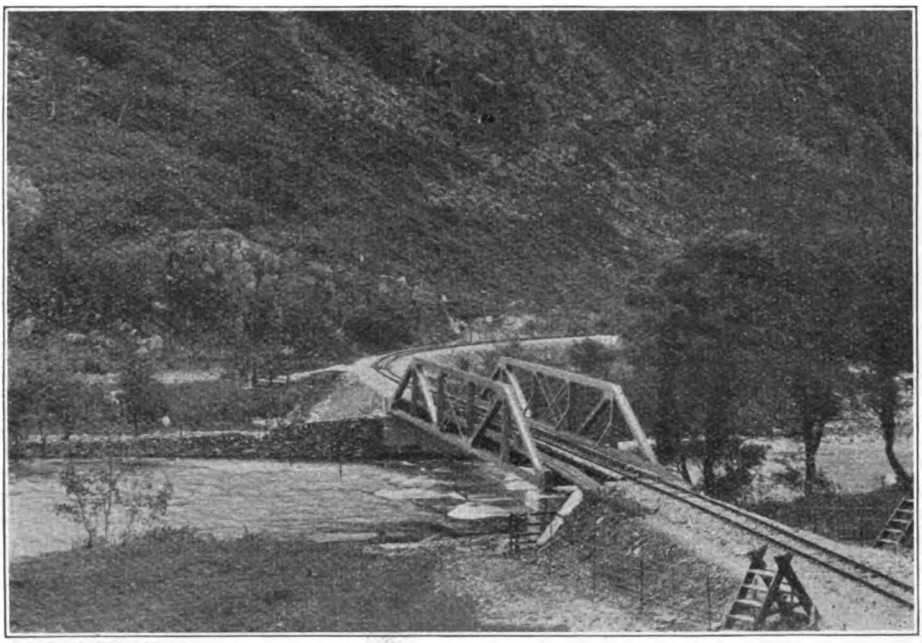
1921, though it was not then recognised as a light railway, the Festiniog and Welsh Highland Railways, though still separate companies, are now worked under one management. To some extent, too, plant and equipment are now used in common, Festiniog engines and rolling-stock being used to meet the requirements of Welsh Highland traffic, though, owing to the small dimensions of certain tunnels on the Festiniog line, North Wales Narrow Gauge locomotives and vehicles cannot be used on that section. With a view to the new situation which would be created by the opening of the Welsh Highland line, the Festiniog Railway was brought under the Light Railways Act, and under the Festiniog Railway (Light Railway) Order, 1923, a connecting line was made between the two railways at Portmadoc. This passes over High Street and Madoc Street at Portmadoc on the level and crosses the Britannia Bridge, which was widened, in ferro-concrete, for this purpose.

Mr. S. E. Tyrwhitt was lent by the Great Western Railway Company early in 1922 to serve as assistant to the late Mr. Vaughan, then General Manager of the Festiniog Railway, and succeeded a few months later, on the death of Mr. Vaughan, to the position of General Manager, also acting as the first General Manager of the Welsh Highland system, holding office during the later stages of construction and the first few months of operation. On his return to Paddington at the end of September, Captain John May was appointed Superintendent of both the Festiniog and Welsh Highland Railways, Colonel H. F. Stephens being the Engineer.

Headquarters are at the old terminus of the Festiniog Railway, adjacent to Portmadoc Harbour, at the northern end of the long viaduct connecting Portmadoc with Boston Lodge (the works and depot of the Festiniog Company) and Minfford. Instead of using the terminal platform, Festiniog Railway trains now make a call at a stopping place without platform adjacent thereto, and thence proceed across the bridge, and partially through the streets to Portmadoc (New) station. This is directly at right angles to the Great Western (late Cambrian) line, but on the coast side, so that Welsh Highland trains have to cross the Great Western Railway on the level by a cast manganese steel



BRYNYFELIN BRIDGE OVER THE GLASLYN RIVER BELOW TUNNELS.

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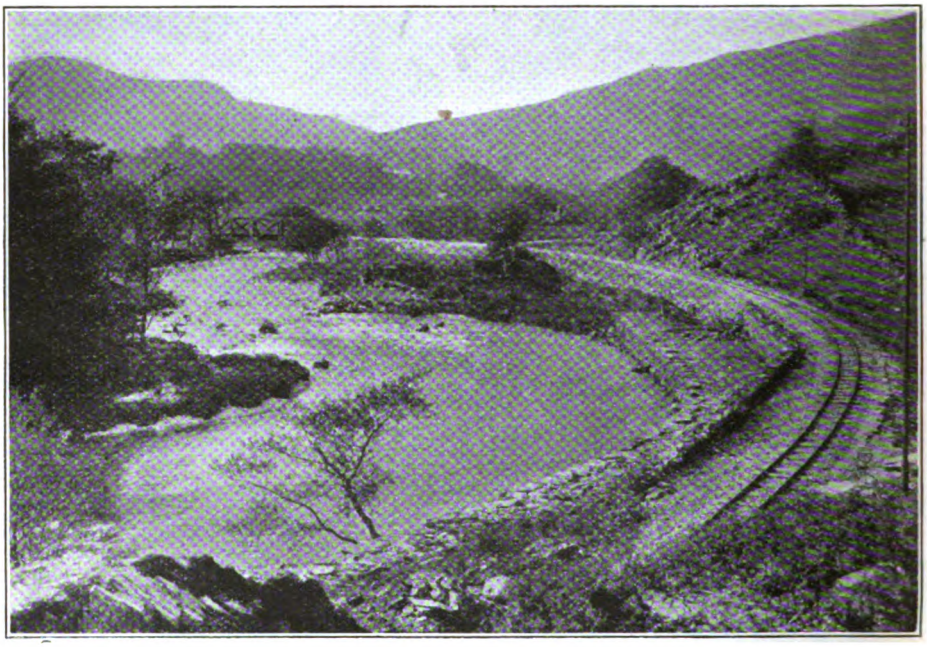
crossing. Catch points under the control of a Great Western signal cabin protect the crossing on both sides.

Portmadoc (New) station has two platforms, the booking office, waiting room, parcels office, &c., being in a building erected at a lower level alongside. There is also a refreshment and bookstall building near by, managed by the Snowdon Mountain Tramroad and Hotels Company, which also provides similar facilities at several stations, notably Beddgelert, South Snowdon and Dinas Junction. Festiniog Railway trains terminate at Portmadoc (New) station and therefore do not cross the Great Western line. As far as possible, Festiniog and Welsh Highland trains connect at this station, through journeys being made last summer in some instances. A pathway leads from the Great Western station at Portmadoc to the Welsh Highland station.

Crossing the Great Western line, exchange sidings are provided on the left-hand side, for exchange of goods traffic with the Great Western Railway, but more particularly for slate traffic coming down from Croesor. For some distance the line is fairly level, in flat country, though the higher ground surrounding indicates that mountainous country is ahead. The first station, Pont Croesor, 1 mile 75 chains, is little more than a stopping place adjacent to a rail and road bridge over the Croesor River. This consists of eight spans of 24 ft., constructed of rolled steel joists. The road bridge alongside is carried on the same piers. One mile further on is Ynysfor, another stopping place, and 30 chains beyond is the old tramway to the Croesor slate quarries. Welsh Highland engines do not proceed more than a train length beyond, traffic on the branch being otherwise worked by the quarry company by horse power. A further 52 chains and Hafod Garregog is reached, a small station which constitutes a centre for an interesting district at the foot of the hills. Thence the line begins to wind about, and the scenery becomes interesting. Two girder bridges of 70-ft. span are crossed, one at Afon Dulif and the other at Afon Nantmor, before and beyond Hafod Garregog. Next is Hafod y Llyn, a mile further on, and at 5 miles 59 chains Nantmor is reached. These are all treated as "halts," the guard issuing and collecting tickets, though at



CURVE APPROACHING BRYNYFELIN BRIDGE.

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most of them there are small waiting sheds, with provision for booking and parcels offices if and when found necessary.

Approaching Nantmor, however, the gradient begins to get severe, 1 in 40 at the station itself, and up through the series of tunnels, respectively 300, 17 and 37 yards in length. These have been cut in the rock face, heavy rock work being, indeed, involved all the way through the Pass of Aberglaslyn. Here the scenery is very fine—between the tunnels—as the line passes immediately above and alongside the Glaslyn River. Beyond the long tunnel, however, the gradients ease somewhat. The line then descends to cross the Glaslyn River as the valley opens out. The crossing is made by the Brynyfelin 70-ft. lattice girder bridge. After crossing the river the line passes under a concrete bridge carrying a new diverted public road, constructed by the railway company. Near this point is a short spur embankment, carried over the public road by an arch bridge. This was constructed at a time when it was intended to cross the river at a different point, and to adopt a different route. This spur embankment is therefore derelict. The remainder of the distance to Beddgelert is severely curved and on gradients which eventually steepen to 1 in 40 through a short tunnel and rock cutting by which the station is approached.

Beddgelert station has booking office and waiting shed, parcels office and bookstall. It is the first crossing place, and some of the trains wait there for lengthy periods, allowing passengers to enjoy the beautiful walk through the Pass of Aberglaslyn via the public road, rejoining the train at Beddgelert or Nantmor according to direction, to visit the little "Alpine Village," or to obtain refreshments at one of the local hotels. Certain trains, though providing through services, actually reverse here, up and down trains exchanging passengers. This is particularly the case with trains which include open observation cars, which are principally worked between Dinas Junction and Beddgelert. A small engine shed is provided at Beddgelert.

TRAINS CROSSING AT SOUTH SNOWDON STATION.

Practically all the way from Beddgelert to Pitts Head halt, 3 miles, is an almost continuous grade of 1 in 40. Originally, it was intended to adopt a gradient of 1 in 28 on this section, but this has been

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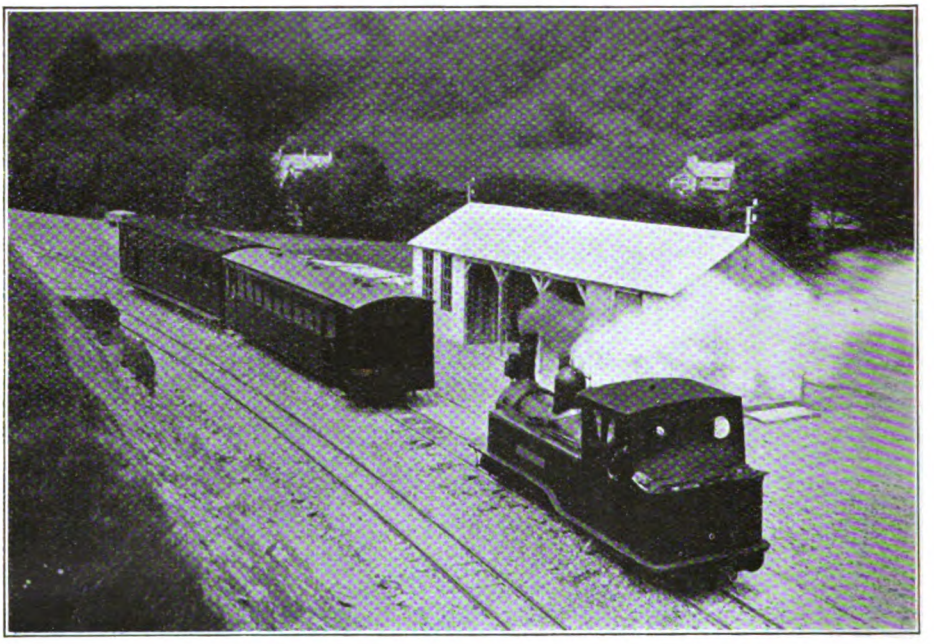
eased by taking a more circuitous route, involving, however, a remarkable sequence of curves, the direct distance from Beddgelert to Pitts Head being less than 2 miles. The first stage includes an elaborate loop, vying with the famous spirals of Continental lines, sometimes on embankment, then in cutting. Near Hafod Ruffydd is another loop, only secondary to that near Beddgelert in interest. Beyond Pitts Head the gradient eases, and at 12 miles 2 chains South Snowdon station is reached. This was the Rhyd-ddu station of the North Wales Narrow Gauge Railway. It is immediately at the foot of Snowdon, and a route to the summit commences immediately adjacent. It is, therefore, a favourite centre for making the ascent from this side. South Snowdon has refreshment rooms, bookstall, &c., and constitutes the second crossing place on the line.

The remainder of the route is less severely graded, but it is still far from easy, and there are many curves and cuttings. Rounding the end of Quellyn Lake the scenery is very fine, and though, after passing the station named after the lake, it becomes more pastoral in character, it is still notable all the way to Dinas Junction. Waenfawr is the next crossing station, with intermediate stations or halts at Quellyn Lake, Salem and Bettws Garmon. At Tryfan Junction, necessarily a crossing station, though less then 2 miles from Waenfawr, the Bryngwyn branch diverges. This was in use for passenger traffic until 1916, with an intermediate station at Rhostryfan.

It is now used only for slate traffic from the Bryngwyn quarries. Bryngwyn is, however, a centre for a group of villages of fair size, and it is anticipated that next summer rail services will be restored. The branch is very severely graded, but as the climb is made splendid views are had of Carnarvon, the Menai Straits and Anglesey. From the terminus several inclines lead to the quarries.



BEDDGELERT STATION, NORTH WALES NARROW GAUGE LOCOMOTIVE AND VEHICLES.

Tryfan Junction has crossing lines and station premises. Two miles further on Dinas Junction is reached, Welsh Highland trains using one side of the London Midland and Scottish station. Before reaching the station the works and engine sheds of the North Wales Narrow Gauge Railway are passed. Beyond the station are sidings for exchange of slates from the

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Bryngwyn quarries and of general goods traffic with the London Midland and Scottish Railway.

For working traffic the North Wales Narrow Gauge Railway contributed the rather powerful 2–6–2 tank engine *Russell* and the 0–6–4 tank engine *Moel Tryfan*. The other engine owned by that company, 0–6–4 "Fairlie" tank engine *Gowrie*, together with the *Snowdon Ranger*, similar to *Moel Tryfan*, was disposed of during the war period. A Baldwin-built 4–6–0 tank engine, as used on the light railways of the French front, has, however, been purchased recently, and is mainly used for the slate traffic of the Bryngwyn branch. The passenger stock consists of eight-wheeled bogie coaches with central couplings and buffers, of which two are brake 1st and 3rd composite carriages, and the remainder carriages of one class, including semi-open observation cars. Both vacuum and Westinghouse brakes are used, but during this winter the vacuum will be fitted to all. There are 124 four-wheeled vehicles adapted to the slate and general traffic carried on the railway. To meet further requirements, Festiniog engines and vehicles are now utilised, including both the small four-wheeled saddle tank engines with tenders of the "Prince" class, and occasionally one of the double-boiler "Fairlies"; also Festiniog coaches and some bogie wagons purchased from the war-time light railway equipment, and which have now been reconstructed to form open observation cars.

On the older portions of the railway, namely, from Dinas Junction to South Snowdon, and from Croesor Junction to Portmadoc, the rails used are 41½ lb. per yard, Indian State Railway standard rails, and for the new portions from South Snowdon to Croesor Junction and the junction railway, 40 lb. per yard, British standard section flat-bottomed rail is used. The rails are in 30 ft. lengths with four bolt fish-plates, weighing 10 lb. per pair. There are 13 sleepers per rail length, and the sleeper dimensions are 4 ft. 6 in. by 8 in. by 4½ in. All points are actuated by hand levers which are padlocked and the key of the padlock is attached to the train staff of the section.

Traffic working between Dinas Junction and South Snowdon is controlled by Wise's patent staff and ticket and between South Snowdon and Portmadoc by ordinary train staff and ticket. No signals are provided. The maximum speed authorised is 15 m.p.h. through facing points and over level crossings.

During the past season four throughout passenger train services were operated daily, together with one each way between Beddgelert and Portmadoc, and one each way between Dinas Junction and Beddgelert. Allowing for the light railway character of the line, the severe gradients and sharp curves, and the intervals at Beddgelert applying to several trains, speed is not high, from two to three hours being occupied on the 21¼ miles between Portmadoc and Dinas Junction. As, however, the journey is one of great scenic interest, this is not a serious objection, while the railway gives access to many places which had no railway facilities. Daily excursion tickets were issued between Festiniog and Welsh Highland stations, while a number of interesting round-trip tours in association with the Great Western and London Midland and Scottish Railways were operated last summer with general approval.

The tourist traffic during the past season was, in fact, very encouraging considering the very bad weather experienced and the fact that it was the companies' first season, while the extraordinary beauty of the district through which the railway runs is comparatively little known. The country served by the railway is sparsely populated so that the winter passenger traffics cannot be heavy, but with the opening up of the natural resources of the district in the way of mines and quarries it is expected that these will rapidly improve. The slate quarries in the Croesor Valley and in the Bryngwyn area are already producing considerable quantities of slates and are capable of very great extension, and there are other quarries in the district upon which development work has commenced. The development of the Cambrian coast, which may be expected by the inclusion of the late Cambrian Railways in the Great Western system, cannot fail to have a very good effect upon the tourist traffics on the narrow gauge railway. It is, however, necessary that further work should be done in the direction of housing and the building of hotels in the whole area, as the present accommodation is within measurable distance of being exhausted in the height of the season.

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THE RAILWAY PORTRAIT GALLERY.

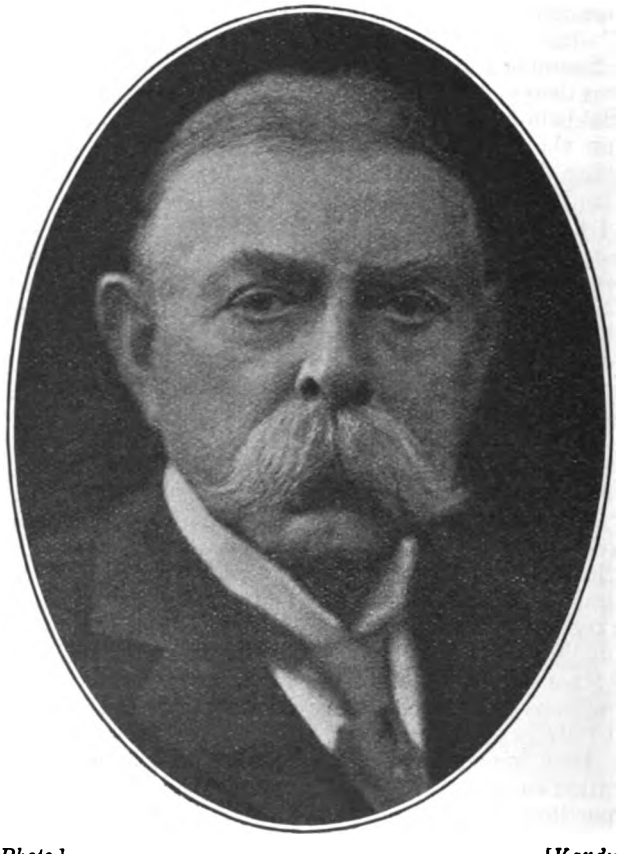

Photo.] [*Vandyk.*

SIR DAVISON DALZIEL, BART., M.P.,

Chairman of the Pullman Car Co. Ltd., who has been elected first Vice-President and Chairman of the Managing Committee of the International Sleeping Car Co. Ltd.

SIR DAVISON DALZIEL, Bart., M.P., who was recently elected first Vice-President and Chairman of the Managing Committee of the International Sleeping Car Company, is well known in Great Britain and abroad, for his success in introducing new developments in artistic and luxurious railway accommodation. Since he bought out the American interests and became Chairman of the Pullman Car Company, over 15 years ago, it has made great strides and greatly extended the annual mileage of Pullman cars on British railways. He has been the member of Parliament for Brixton since 1910 and was created a baronet in 1919. He is an Officer of the Legion of Honour in France and a Commander of the Crown in Italy. His active participation in the control of the International Sleeping Car Company has for many years past involved almost a weekly journey between London and Paris. Speaking French as fluently as English and being well acquainted with railway directors and officers on both sides of the Channel, Sir Davison is a valuable link between the railways of Great Britain and the Continent.

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"The Railway Bungalow."

By W. TURNER PERKINS.

THERE are many old inhabitants of Guernsey who have never left its island shores nor beheld any nearer approach to a railway than the line upon which electric cars travel between St. Peter, the chief port; and St. Sampson, the seat of the granite industry which has furnished the surface material of main roads in so many parts of the British Isles. But close to the highway, on the extremely picturesque shore of Cobo Bay, they now see a railway bungalow, belonging to Mr. W. H. Smith, who recently retired from the office of local district agent to the Great Western Railway. This original seaside home consists of two coaches, one of which—originally a first-class saloon—was purchased at Swindon with all its fittings intact. A section is screened off at one end as a bedroom, containing two brass bedsteads that once formed part of the equipment of a hospital train on the Great Western system. The rest of the saloon serves as an extremely comfortable sitting and dining room, in which a dozen or more persons can be accommodated at the long centre table.

The second coach belonged to Brunel's "broad gauge." Converted, with equally happy results, it now embraces two bedrooms and a kitchen, with a store cupboard wherein blankets and sheets may be kept, without the slightest fear of damp. Outside this coach is a large tent used for dressing, when bathing is enjoyed on the long stretches of sand lying between the bold rocks that contribute so much to the natural beauty of Cobo Bay.

Photo.] [*Miss N. E. R. Smith.*

GENERAL VIEW OF RAILWAY BUNGALOW, COBO BAY, GUERNSEY.

The two vehicles were brought from Weymouth to St. Peter Port in the Great Western Company's steamship *Pembroke*, and thence hauled by a traction engine upon lorries specially strengthened for the unusual task. The character of load rendered its transport difficult and other traffic was obstructed over the whole distance of nearly four miles. Old sleepers, which were not wanted by the company when the broad gauge was

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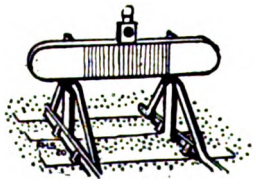
abandoned, are used to support the coaches, and some of these heavy timbers have also been employed with success to form a platform in the angle nook of the structure, so that afternoon tea may be enjoyed out of doors.

Considerable excitement was aroused when the residents saw what they described as "The Railway Train" arrive in the village, and, in common with visitors from many parts of the world, they continue to watch it with unfeigned curiosity and interest. Everybody in the island of Guernsey has now heard of "The Railway Bungalow," and it must be regarded as the finest advertisement which the Company could have of their excellent rolling-stock. It will, at the same time, remain in the public mind as positively unique among the many contrivances of domestic marine retreats. Great bushes of tamarisk partly obscure the "holding" from general view, but it really stands within less than 40 yards from the sea, rejoicing in an outlook that stretches without obstruction of any sort across the wide Atlantic.

Mr. Smith was in the employment of the Great Western Company for 44 years, 33 of which were spent in Guernsey, where by reason of his multifarious services he was immensely popular with residents and visitors alike. He is now in the enjoyment of a well-earned pension, and although nominally "out of harness" in the railway world, is ever active as Lloyd's agent, as also in other capacities, in all of which his long experience of public life is a valuable asset to the entire community. Accompanied by his wife and family, his happy hours of leisure are enjoyed in "The Railway Bungalow."

Photo.] INTERIOR OF SITTING ROOM. [*Miss N. E. R. Smith.*



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British Locomotive Practice and Performance.

By CECIL J. ALLEN,
A.M.Inst.T., A.I.Loco.E.

Photo.] [*Henry L. Salmon.*

LONDON & NORTH EASTERN RAILWAY.

Marylebone–Sheffield Restaurant Car Express.
Great Central 4-4-0 locomotive No. 506,
"Butler Henderson."

COMMENT on the train service alterations which came into force for the winter months on October 1st can be compressed into small compass, owing to their limited extent as compared with those of the previous winter. On the London & North Eastern Railway, the accelerated London-Leeds times, which are, in the main, faster than those of pre-war days, are retained, despite the greatly-increased loading of the majority of the trains concerned. The 5.45 p.m. down Leeds, Bradford, Halifax, Hull and Lincoln express in particular, and the corresponding up working from Leeds at 10.15 a.m., with daily unpiloted loads now averaging rather over 500 tons, and, of course, "Pacific"-hauled, on their accelerated summer timings have no rival for difficulty of operation, not even on the Great Western Railway. Such bookings as 36 min. from Peterborough to Grantham, or 171 min. for the 156 miles from Doncaster to London, inclusive of a stop at Peterborough, are really astounding with daily loads like this. The 7.50 a.m. from Leeds to King's Cross is now altered to stop daily at Retford, and goes one better in time than the express last mentioned—although with a far lighter load—by coming up from Doncaster in 170 min., with stops at both Retford and Grantham. From Grantham the booking is now within 1 min. of the pre-war up Manchester express due at 7.48 p.m., and with nearly double the load of the latter. The non-stop runs of the "Harrogate Pullman" between London and Leeds are continued through the winter, and are additional to the previous winter's services.

On the London Midland & Scottish Railway the Midland Division has brightened up the services between St. Pancras and Leeds, the acceleration consisting chiefly of a curtailment of the somewhat over-generous working allowances between Trent and Chesterfield, where trouble with colliery subsidences is responsible for serious limitations of speed at various points. There are now seven Midland expresses daily between London and Leeds in 3 hrs. 55 min. to 4 hrs., including the accelerated 12.55 p.m. up, which calls only at Rotherham and Chesterfield, and covers the 146 miles from the latter town to St. Pancras in 166 min. working time, at an average speed of 52·8 m.p.h. Before the war, Rotherham was the only stop, and the overall time was 3¾ hours, instead of the present 4 hours, but for the present Chesterfield

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to London sets up a new standard of long-distance post-war running on the Midland Division. On the Western Division the most notable alteration is probably the insertion of a Willesden stop in the two-hour London-Birmingham schedule of the 9.10 a.m. down express, corresponding to that of the 4.50 p.m. up. The day Scotch expresses, by both East and West Coast routes, adhere to their accelerated summer timings, but the night trains revert to their leisurely progression of last winter, which, after all, though not perhaps spectacular, is a reasonable and sensible arrangement for night travel in the winter months, when no passengers desire to arrive at their destinations at unconscionably cold and early hours.

The Great Western authorities carry on into the winter with a fine programme, including such novel developments as an entirely new evening service from the West of England, leaving Penzance at 2.5 p.m. and Plymouth as late as 6.20 p.m., calling at Exeter, Taunton and Westbury, and running the 95½ miles up from the latter town to Paddington in the brilliant time of 97 min. All the crack summer schedules, both in the matter of distance and speed, are continued, with the exception of the Torquay non-stops; but the latter runs are replaced, as usual, by a three-hour run to Exeter on the 12 noon down, and a 205-min. run over the 193¾ miles from Newton Abbot to London on the corresponding up train. The October issue of our old friend "Bradshaw" was anxious to have us believe that the latter express was to call also at Exeter, and to cover the 173¾ miles from there to London in 150 min., but even the new "Castle" class is not yet to be called upon to perform such flying feats of speed as this! On the North main line the Chester and Birkenhead acceleration is perpetuated by the retiming of the 10.40 a.m. down to run non-stop from Birmingham to Chester in 95 min., which is no less than 13 min. below the admittedly ample 108 min. of the past summer; the corresponding up time is increased from 110 min. to 112 min., but now includes a Shrewsbury stop. The down train should be well worth watching, as its average speed of 53·4 m.p.h. from Birmingham to Chester, with what is now a luncheon car train instead of a featherweight of three or four bogies only, has to cover at least four very severe service slacks.

The best features of the Southern Rail-

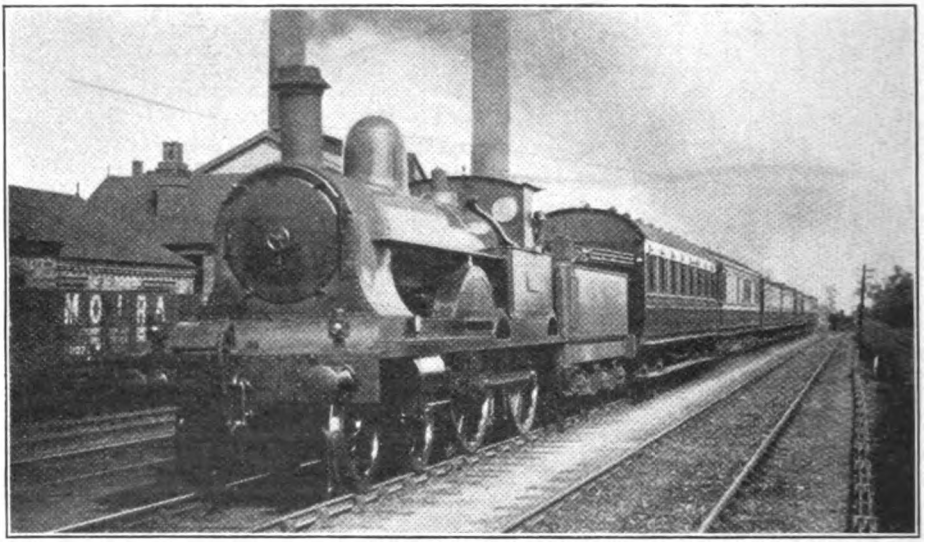

Photo.] LONDON, MIDLAND & SCOTTISH RAILWAY. [*Henry L. Salmon.*

10.30 a.m. Lowestoft-Liverpool Restaurant Car Express on North Staffordshire Section, near Tutbury.
London & North Western four-cylinder compound locomotive No. 1923, "Agamemnon."

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way winter fare are probably provided by the South Eastern section, in particular by the notable improvement of the winter service to and from Folkestone. In addition to the 4.5 and 7 p.m. down 80-min. trains from Charing Cross, the 1 p.m. retains the accelerated 80-min. schedule, the 6 p.m. continues to run for the winter, with its 43-min. start-to-stop booking over the 39½ miles from Tonbridge to Folkestone, and an entirely new daily train, developed out of the previous 4.30 p.m. semi-fast, and the Friday 5 p.m. 80-min. express, runs from Cannon Street at 5 p.m. to Folkestone in 85 min., with a 3-min. stop intermediately at Ashford. So Folkestone has now a series of four speedy evening expresses at practically hourly intervals—4.5, 5, 6 and 7 p.m.—and the amazing improvement on pre-war winter facilities is well expressed by the fact that the slowest of these—the 90-min. 6 p.m.—is only a minute slower than the *best* time of 1914. In the up direction the service is but little altered, and there are no changes of note on the Kent Coast route, save that the Sunday Pullman Limited to and from Margate and Ramsgate is combined for the winter with the ordinary expresses, calling additionally at Faversham and Westgate going down, and at Herne Bay coming up, with proportionate increase of journey time.

On the South Western Division the 3.30 p.m. down Bournemouth train is this winter retained in the timetable for the first time, and it is also of note that every hourly Bournemouth express from 11.30 a.m. to 6.30 p.m. inclusive carries either a restaurant car or facilities for light refreshments. On the West of England section the 11 a.m. down covers the 88 miles from Salisbury to Exeter in the notable time of 105 min., inclusive of a stop at Sidmouth Junction. I hope very shortly to try a run on this smart booking, the train concerned being the heaviest running on the winter service. The 10.30 a.m. up runs as before from Exeter to Salisbury in 104 min., with the same stop, but this is a lighter train, and the 3 p.m. down covers the distance non-stop in 101 min., or 5 min. over the pre-war best. On the Brighton section the accelerations of the summer to and from Eastbourne are maintained, and the service generally sees very little curtailment.

Before proceeding to performance, I have a little further to say on the "single driver" question, following on the remarks (based on a communication on this subject addressed to the *Observer* newspaper) made in my October article. Needless to say, the comment produced a reply from the writer of the original letter. Space forbids my setting out this reply in full, but without any injustice to the argument, I think it is possible to compress its salient points into a brief compass. My correspondent vigorously approves the suggestion that booster equipment might have increased the effective life of the various single-driver types of the past. "In the large single-wheelers with 8 ft. to 9 ft. 6 in. wheels, which I advocate," he writes, "it would not, of course, be possible to use large boiler barrels, as obviously they would have to be placed between the wheels, thus restricting their external diameter to 4 ft. 3 in. or 4 ft. 4 in. I would depend on a large wide firebox of the Wootten type, placed over the trailing wheels, which would allow of the latter being of ample size, say 4 ft. 8 in. diam., and would afford plenty of room for the booster." To which the appropriate rejoinder is:—How would it be possible to arrange within the limits of so small a boiler diameter, tubes adequate in number and size both to allow of sufficient draught from a firebox of such large dimensions, and also to furnish sufficient boiler heating surface to prevent an unduly large proportion of the heat, developed from the fuel burned in the same firebox, from being uneconomically thrown to waste out of the chimney?

"Such a type," I read, "would beat any 4-4-0 or 4-4-2 running, in haulage power, speed, efficiency and economy." Where is the proof of this dogmatic statement? How is it possible to design locomotives piecemeal in this fashion, and to set on one side the well-defined economic limits governing the relation between boiler and firebox dimensions, just as much as between the steam-producing power of boilers and the cylinders, motion and wheels by which this power is translated into useful work? No amount of such unsubstantiated generalisation, again, will disprove the fact that there must be a definite relation between the potential work developed and the capacity for

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adhesion by which alone the work can be transmitted to the rail, and thus the progressive coupling on passenger locomotives of two, three, and now—in the case of the Great Western Railway "4700" class—four axles, has been pursued by locomotive engineers, not by whim or caprice, but in obedience to physical laws which, however scorned on paper, demand serious consideration in actual practice.

The letter proceeds: "Even upholders of modern methods sometimes harbour fallacies, and I will mention one or two of them. (1) The ready assumption that a double-headed train is not economical, let us say a well-filled express totalling 500 tons. Yet a well-filled train of 200 tons drawn by one engine *is* economical, although for the expenditure of half the energy and half the wages, paid to two enginemen only instead of four, we get a return of 40 per cent. only of the fares represented by the double-headed train." To which the reply is, obviously, that there must be light as well as heavy trains in practically every timetable; but when the 500-ton trains have to be run, economy is all on the side of handling them with one locomotive, as is now done daily on the Great Northern main line.

And then: "(2) That the 'susceptibility to adverse weather conditions or abnormal loads' only exists in engines of the single-driver type." If anyone can find this argument in my article of October last, I should be interested to hear of the discovery. The real contention was that the susceptibility referred to must, in the very nature of things, be proportionate to available adhesion, and that the single driver, in consequence, is, generally speaking, the most susceptible of all express locomotive types to such conditions. The writer of the letter maintains that he has never been "stalled" behind a single; neither have I, but I have known very serious delays, on one line in particular, from this cause—so serious, indeed, that the dislocation of suburban services that they entailed rendered necessary the early removal of the type concerned to a country length of line where the track was level and the loads were light. I cannot spare more space to continue this discussion; but I contend emphatically that the case for reversion to modernised single-wheelers is "not proven."

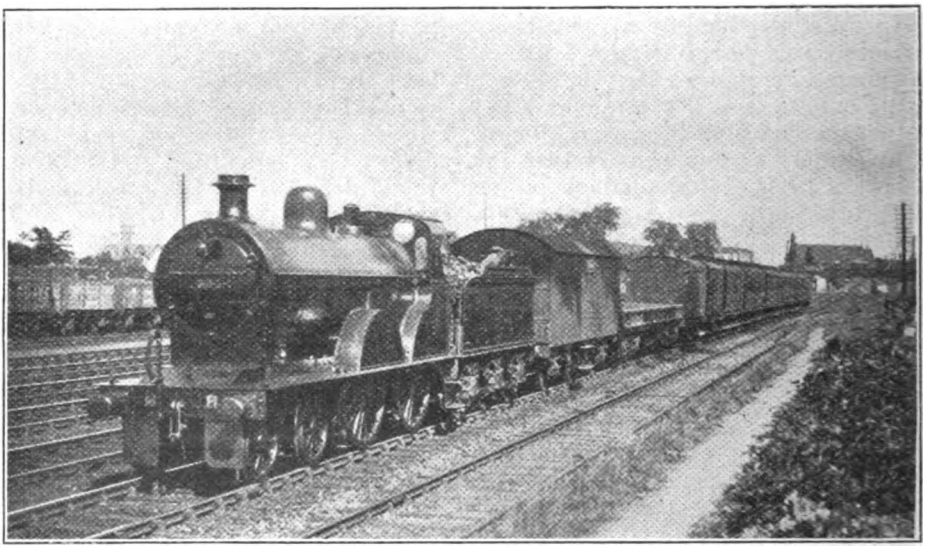

Photo.] LONDON MIDLAND & SCOTTISH RAILWAY. [*Henry L. Salmon.*

York-Sheffield train near York. Midland rebuilt 4-4-0 locomotive No. 354.

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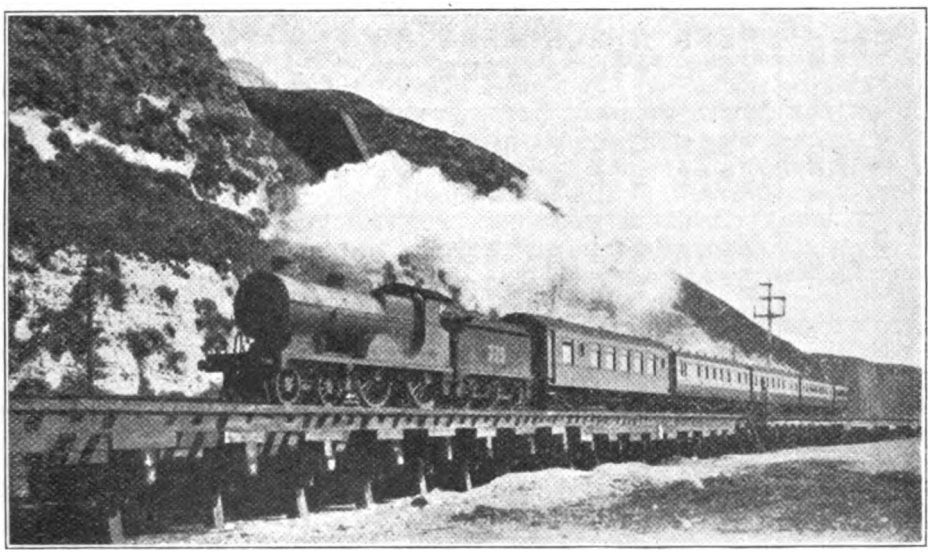

Photo.] SOUTHERN RAILWAY. [*R. G. Bolton.*

Deal portion of 11 a.m. Folkestone-Charing Cross train passing Dover beach.
South Eastern & Chatham 4-4-0 locomotive No. 775.

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adhesion by which alone the work can be transmitted to the rail, and thus the progressive coupling on passenger locomotives of two, three, and now—in the case of the Great Western Railway "4700" class—four axles, has been pursued by locomotive engineers, not by whim or caprice, but in obedience to physical laws which, however scorned on paper, demand serious consideration in actual practice.

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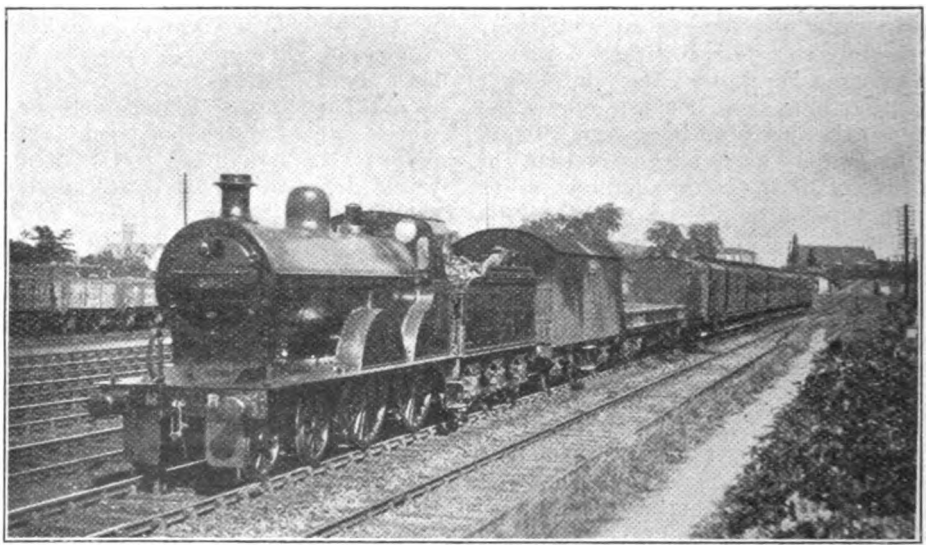

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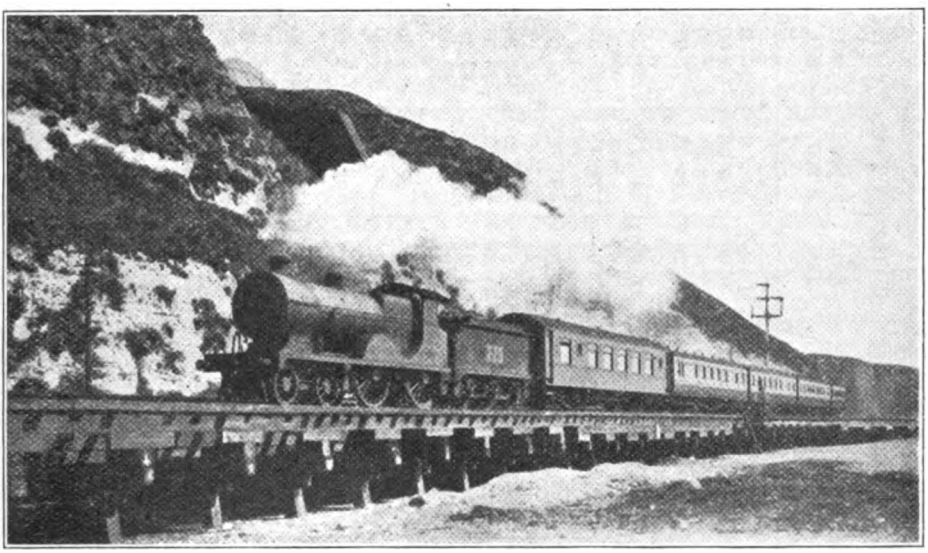

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L. & N.E.R. (G.N. SECTION): 5.30 P.M. KING'S CROSS—GRANTHAM.

Distance.	Engine No.: / Load (axles): / Load (tons tare): / ,, (tons full):	Schedule.	A. 1418 38 265 280	A. 1434 38 263 280	A. 1456 38 267 285	A. 1456 38 267 285	A. 1442 40 274 290	A. 1442 52 364 390	P. 1478 38 264 280	P. 1472 42 300 320	P. 1475 §55 §430 470	Summary of minimum times.
Miles.		Min.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
0·0	King's Cross	0	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
2·5	Finsbury Park	—	6 20	6 30	5 15	5 45	6 35	8 10	5 30	5 35	7 05	5 15
9·2	New Barnet	—	14 45 sigs.	14 45	12 40 sigs.*	13 20	14 35	17 25	13 00	13 30	15 15	12 40
12·7	Potter's Bar	—	21 20	19 20	20 35	18 00	19 15 p.w.r.	22 35 p.w.r.	17 00	17 45	19 35	16 40
17·7	Hatfield	25	27 00	24 30	25 40	23 05 sigs.	24 45	27 55	21 45	22 35	24 30	21 25
25·0	Knebworth	—	35 05	32 40	33 05	33 05 sigs.	32 55	36 00	28 55 sigs.*	30 20 sigs.	31 20	28 15
31·9	Hitchin	40	41 45	39 35	39 30	40 20	39 20	42 35	39 30	37 50	37 35	34 30
37·0	Arlesey	—	45 50	43 50	43 30	44 45	43 20	46 35	43 55	42 50	41 45	38 30
44·1	Sandy	—	52 05	50 15	49 25	51 05	49 15	52 25	50 15	49 15	47 30	44 20
51·7	St. Neot's	—	58 55	57 45	56 15	58 05	56 15	59 05	57 15	56 30 p.w.r.	54 10	51 00
58·9	Huntingdon	66	65 00	65 00	62 35	64 30	62 55	65 30	63 40	64 15	60 35	57 05
62·0	Leys Box	—	68 05	68 35	66 00	67 30	66 30	68 50	66 45	68 25 p.w.r.	64 00	60 05
69·4	Holme	—	74 35	75 30	73 00 sigs.	74 10	73 25 sigs.	75 35	73 05	76 10	70 35	66 25
75·0	Fletton Junction	—	79 45	—	80 10*	79 25	79 25	81 15	78 00 sigs.	81 45	76 00	71 20
76·4	Peterborough	84	81 40	83 15	84 30	81 25	82 10	83 15	80 45	83 35	78 05	73 10
79·5	Werrington Junction ..	—	86 30	88 10	90 00	87 05	87 45	88 55	85 50	88 10	—	77 45
88·6	Essendine	—	95 40	96 55	98 40	95 50	96 25	98 20	94 50	96 45	—	86 20
97·1	Corby	—	105 15	105 45	sigs.	105 15	105 45	109 35	104 20	105 50	—	95 10
100·1	Stoke Box	—	108 55	109 20	sigs.	109 05	109 50 sigs.	114 10 sigs.	107 55	109 15	—	98 35
105·5	Grantham	117	115 00	115 15	121 55	115 40	118 05	121 05	114 00	114 30	—	103 50
105·5	Net times (min.)	117	112½	115¼	110	112	113	118½	108¾	108	78¶	103¾

A = "Atlantic." P = "Pacific." * Dead stand. ¶ To Peterborough, schedule 82 min.
§ Including quintuple dining-car set (12 axles = 118 tons tare).

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at times on these Great Western Birmingham runs. My friend does, however, confess to one clear error in his log—which I am surprised that I failed to notice myself—in that his Aynho Junction time was shown as a minute earlier than was really the case, so that his true time from Risborough to Ashendon Junction was 23 min. 35 sec., and not 22 min. 35 sec., my own record of 23 min. 15 sec., therefore, remaining unbeaten.

Another correspondent sends details of a recent run on which 4-cylinder 4-6-0 No. 4043, *Prince Henry*, with a 12-coach load (including two dining cars) of not less than 362 tare tons, and probably 390 tons full, did the Princes Risborough-Ashendon stretch in as little as 6 min. 50 sec., at an *average* speed of 83·4 m.p.h., and claims a maximum rate here of 92 m.p.h. But this, be it noted, was 10 sec. less than my own fastest time, with a top speed of 86½ m.p.h., and 20 sec. less than that of my former correspondent, who claimed 89 m.p.h. By the way, the exact point at which Ashendon Junction times are taken is of importance. The *signal-box* is the correct location, as it is at Aynho Junction also; it is, in fact, my practice always to take a junction box rather than the actual junction points.

On the fine run last-mentioned, Old Oak Common West was passed in 6 min. 5 sec., Northolt Junction in 20 min. 20 sec., at 64 m.p.h. and Beaconsfield in 27½ min., at 56½ m.p.h.; a speed of 77½ m.p.h. was attained before Wycombe, which was passed slowly in 31 min. 40 sec., while Saunderton was breasted at 41 m.p.h. in 39 min. 10 sec.; Risborough was passed in 43 min. 5 sec., Haddenham in 46 min. 55 sec., Ashendon in 49 min. 55 sec., Blackthorn in 56½ min., at 72½ m.p.h., Bicester in 59½ min., Ardley in 63 min. 25 sec., at 56 m.p.h., Aynho in 68½ min. (I see from the record that this correspondent has timed to the boxes at each of these junctions), and Banbury in 73¾ min.; a p.w.r. check was experienced at Fenny Compton, but Leamington was passed in 93 min., after a maximum rate of 77½ m.p.h. on Southam Road bank; Warwick was passed in 95 min. 40 sec., Hatton in 101 min., at 39 m.p.h., Knowle in 109¼ min., and after a final spurt at 69 m.p.h., the stop was effected at Snow Hill in exactly two hours from Paddington—an extraordinarily fine feat with such a train as this.

My own records this month relate chiefly to the Great Northern section of the London and North Eastern Railway. I make no apologies for returning so early to this route. It is partly because I have been fortunate enough to secure some very noteworthy records; but chiefly because in this group, more than any other, the first fruits of grouping are becoming very apparent in the exchange of locomotives between the various sections, or the through running of engines from one section to another. Consequently, in the tables or descriptions which follow there will be found details of the working of North Eastern "Atlantics" over the Great Northern main line—a daily occurrence during the summer on the 5.30 p.m. down Newcastle express and the corresponding up train—the converse working of Great Northern "Atlantics" from York northwards to Newcastle, and the performances of Great Central 4-cylinder 4-6-0's on the Pullman trains on the non-stop London–Leeds run, which they undertake frequently.

In the first table are shown a series of runs on the moderately-weighted 5.30 p.m. down Newcastle express from King's Cross to Grantham. On the initial trip No. 1418 suffered two severe signal checks at Hadley Wood from the 5.7 p.m. North London train from Broad Street to Potters Bar; then we touched 79 m.p.h. at Three Counties, and further achieved very notable work north of Sandy, breasting St. Neots at 66 m.p.h., touching 75 at Offord, only falling to 54 at Leys Summit, and reaching 79 again on Ripton Bank, which converted our 2 min. arrears at Hatfield into 2¼ min. early at Peterborough. We gained 2 min. to Grantham, checks notwithstanding. No. 1434 did nothing of note to Peterborough, but thereafter blazed away in most surprising fashion, reaching 67 m.p.h. at Tallington, only falling to 58½ by the time we had mounted to Bytham, and 51½ on the continuation of the ascent to Corby; on the short Corby "level" we reached 55 m.p.h., and then went up the 3 miles at 1 in 178 to Stoke at a minimum of exactly 50 m.p.h.—a fine feat for an "Atlantic," for which type 32 min. from Peterborough to Grantham with 280 tons was a very unusual time.

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The first effort of No. 1456 was a remarkable performance. To start with, I was electrified by the fastest time I have ever recorded out to Finsbury Park on any train other than the old four-coach 2.15 p.m. down Leeds of 1911; not only so, but we touched 61½ m.p.h. at Wood Green, and on passing New Barnet had proceeded 5 miles up the 1 in 200 without speed dropping below 51½ m.p.h. But a time of 12 min. 40 sec. out to New Barnet was asking for trouble, and we got it by being dead stopped for 30 sec. on account of that same North London train ahead. Even then we were only 40 sec. late through Hatfield, and by touching 74 m.p.h. there and only falling to 53½ at Woolmer Green we passed Hitchin ½ min. ahead of time. A top speed of 80½ m.p.h. was reached at Three Counties, and we were still doing 74 at Biggleswade; the minimum at St. Neots was 68 m.p.h., but the engine was then eased, as we did not exceed 70½ at Offord and fell to 49 on Stukeley Bank. After that came a second dead stand for signals—of 20 sec. at Fletton Junction, after a long preliminary slowing—despite which we actually got through Peterborough only ½ min. late, and were doing so excellently at Tallington, where the speed was 69 m.p.h., that an early arrival seemed certain. But it was not to be; adverse signals were experienced all the way thence to Grantham, and we arrived 5 min. late. The net time of 110 min. from King's Cross to Grantham is no exaggerated estimate; indeed, the 64·9 miles from Greenwood (Hadley Wood) Box to Fletton Junction, with a rising start of 3 miles at 1 in 200, and the slow stop mentioned, were covered start-to-stop in 65 min. 40 sec.

The second effort of No. 1456 was another fine trip; by speeds of 61 m.p.h. at Wood Green, 48½ at New Barnet, 47 at Potters Bar, and 71½ at Hatfield, we were through the latter town nearly 2 min. early. Then followed signal checks to Hitchin, but good work ensued beyond Huntingdon, with a minimum of 54 m.p.h. on Stukeley Bank, and a maximum of 79 at Holme. So we were through Peterborough 2½ min. early, and easy subsequent running sufficed for the maintenance of time. The two runs behind No. 1442 were on the 121-min. schedule which obtained until the end of June last. On the first of them, after a slight p.w.r. check at Hatfield, we touched 80½ m.p.h. at Three Counties, and by good, but not exceptional, speeds thereafter were through Holme, 69·4 miles, in 72½ min. net from the start. But for adverse signals at Fletton and beyond Stoke, we could have made Grantham in 113 min. comfortably. The last "Atlantic" trip was a good performance with a far heavier train; we maintained 80½ m.p.h. for two miles north of Hitchin, made the fastest time of the series from there to Huntingdon (27 miles in 22 min. 55 sec. = 70·7 m.p.h.), passing both Sandy and Offord at 74 m.p.h., and falling to 65 at St. Neots and 51 at Leys Box, while the final maximum at Holme was 77½ m.p.h. After that we went more easily, but had no difficulty in maintaining time.

To a "Pacific" a train of this weight is obviously a plaything. No. 1478, after passing Finsbury Park in 5½ min., touched 61 m.p.h. at Wood Green, and breasted Potters Bar at 53 m.p.h., after which we reached 74 m.p.h. at Hatfield, passed 3¼ min. early, and in a time I have only once beaten in the past 15 years—again on the short-lived 2.15 p.m. down Bradford express. We could have been through Hitchin comfortably in 35 min., but were running so well in advance of schedule as to be stopped for signals at Langley. From the Langley start we passed Fletton Junction, 48·3 miles, in 46 min. 25 sec., the most brilliant part of the running being the minimum of 57½ m.p.h. at Leys, followed, after a maximum of 79 m.p.h. at Holme, by a minimum of 68 before shutting off steam for Peterborough, which, despite adverse signals just before the station and the Langley stop, we were through in 80¾ min. from King's Cross. Net time to this point could not have exceeded 75½ min. for the 76·4 miles. Quite leisurely going followed to Grantham, and yet we arrived 3 min. early.

No. 1472, with a rather heavier train, also made an excellent start, getting through Hatfield 2½ min. before time, and was similarly checked, though not this time stopped, before Hitchin. Two bad p.w.r. checks were experienced in addition between St. Neots and Holme, but we still contrived to pass Peterborough just before time, and then made a superlative spurt on to Grantham, covering the 29·1

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miles from very slow pass to stop, including the long and trying rise to Stoke, in 30 min. 55 sec.—a time which I have never previously beaten, or even equalled, with any load. We did not exceed 64½ m.p.h. on the level or slight rise from Tallington to Essendine, but we were still doing 57½ at Little Bytham, and never went below 53 on either the 1 in 200 to Corby or the 3 miles at 1 in 178 to Stoke, the short Corby "level" raising the rate to 55½ m.p.h. A very fast descent to Grantham concluded the run, with a top speed of 74 m.p.h.

The last of the down "Pacific" runs reaches me from a correspondent. It was

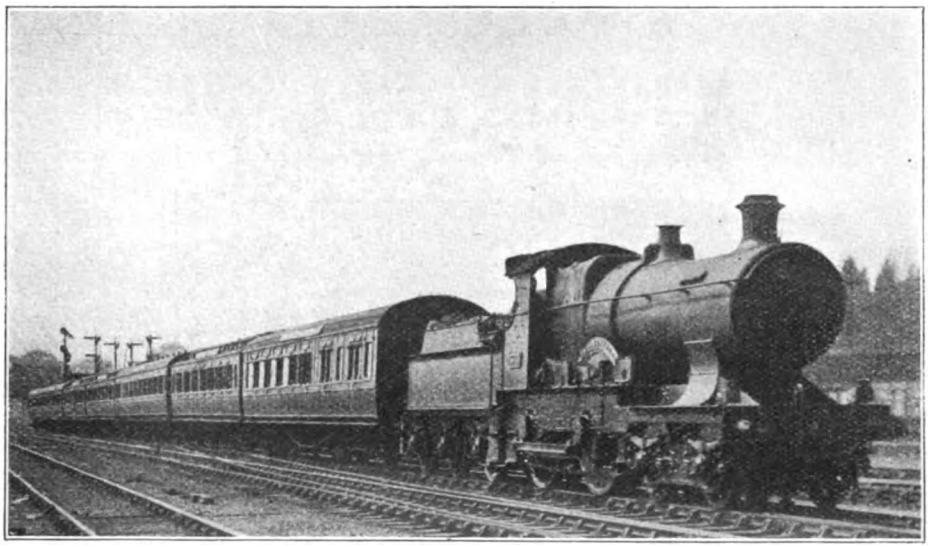

Photo.] GREAT WESTERN RAILWAY. [*F. E. Mackay.*

Up Worcester express. 4-4-0 locomotive No. 3715, "City of Hereford."

on a day when the 10.10 a.m. down, which is generally now "Pacific"-hauled, and necessarily so on its accelerated timing with such a load, had been delayed 3½ min. in starting. To cover the 76·4 miles from King's Cross to Peterborough in 78 min. 5 sec. with such a train as this was really an extraordinary feat, and testifies yet again to the amazing capabilities of the new type. Maximum and minimum speeds were not given in my correspondent's record, but it may be noted that the *average* speed up the 1 in 200 from Wood Green to New Barnet was 50·4 m.p.h., up the continuation from the latter to Potters Bar 48·5 m.p.h., and up the corresponding grade from Huntingdon to Leys Box 54·4 m.p.h.—with a 470-ton train. Over the 12·2 miles from Hitchin to Sandy the average was 73·8 m.p.h.; over 30·3 miles from Stevenage to Huntingdon it was 70·4 m.p.h.; over 62·3 miles from Potters Bar to Fletton Junction 66·3 m.p.h., and for the start-to-stop journey from King's Cross to Peterborough 58·7 m.p.h. Exactly 58½ miles were covered in the first hour.

Each table concludes with a summary of the fastest point-to-point times, which, as will be seen, represent something less than "even time" from King's Cross to everywhere from St. Neots onwards. The net time of No. 1478 to Peterborough, added on to the time of No. 1472 from there to Grantham, would alone yield jointly a net time of 106½ min. from London to Grantham, or 10½ min. under schedule. I have on one previous occasion clocked from Hitchin to Huntingdon in 55 sec. less than these minimum times, but the latter are confined to the nine runs actually detailed.

The Grantham–York table incorporates some truly thrilling efforts. As will be seen, the North Eastern "Z" drivers made a point, night after night, of getting through Retford in less than "even time," and the average of the Great Northern runs shown is but little inferior. To take

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L. & N.E.R. (G.N. & N.E. SECTIONS): 7.31 P.M. GRANTHAM—YORK AND DARLINGTON.

Distance.	Engine No.: / Section: / Load (axles): / Load (tons tare): / „ (tons full):	Schedule.	1446 G.N. 38 265 280	1438 G.N. 38 267 280	1446 G.N. 40 274 290	285 G.N. 52 364 390	721 N.E. 38 265 280	736 N.E. 38 269 280	727 N.E. 38 263 280	721 N.E. 38 264 280	Summary of minimum times.
Miles.		Min.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.	M. S.
0·0	Grantham	0	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00	0 00
4·2	Barkstone	—	7 15	7 00	6 45	7 35	7 00	6 55	7 00	6 40	6 40
9·9	Claypole	—	12 05	12 00	11 20	12 20	11 40	11 40	11 45	11 20	11 15
14·6	Newark	16	16 10	16 05	15 00	15 55	15 25	15 30	15 35	15 15	14 50
20·9	Carlton	—	21 50	21 35	20 25	21 20	21 05	20 50	20 55	20 20	19 55
28·2	Markham Box	—	29 35	28 55	28 15	29 30	28 35	28 20	28 15	27 20	26 55
33·1	Retford	36	34 10	33 20	32 55	34 20	33 15 p.w.r.	33 00	32 45	32 00	31 25
38·4	Ranskill	—	38 45	38 25	37 40	39 15	40 40	38 10	37 40	37 00	36 10
42·2	Bawtry	—	42 10 sigs.	42 15	41 05	43 00	44 30	41 50	40 55 sigs.	40 10	39 20
45·6	Rossington	—	45 55 sigs.	46 15 sigs.	45 00	47 15	48 35	45 55	45 30 sigs.	43 30	42 40
50·5	Doncaster	54	52 00	51 10	50 15	51 55	53 30	50 35 sigs.	52 45	47 30	46 40
54·7	Shaftholme Junction ..	59	57 15	56 00	55 20	56 25	58 10	61 50	57 40	51 25	50 35
60·5	Balne	—	63 30	62 20	61 20	62 40	64 00	68 05	63 20	56 55	56 05
64·3	Templehirst	—	67 40	66 45	65 25	67 00	68 00	72 20 sigs.	66 55	60 20	59 30
68·9	Selby	77	72 40	72 10 sigs.	70 35 sigs.	72 20	73 25	78 15	72 00	65 05	64 15
73·0	Riccall	—	78 40	78 40 sigs.	84 30	78 20	79 15	85 20	78 30	70 40 sigs.	69 50
80·7	Chaloner Whin Junction ..	—	87 20 sigs.	88 30	92 50	87 55 sigs.	88 00 sigs.	93 25 sigs.	86 55 sigs.	80 45 sigs.	77 55
82·7	York	94	91 00 / 91 30 sigs.	pass 91 25	96 20 —	93 30 —	pass 92 15	pass 98 30	pass 92 30	86 25 —	80 50§ 81 25¶
126·8	Darlington	142	146 05	143 25	—	—	142 20	144 30	139 35	—	—
82·7	Net time to York¶ (min.)..	94	89	90	88¼	92½	88½	88½	87	82	81½
126·8	Net time to Darlington (min.)	142	143	142	—	—	138	134	133½	—	—

¶ Equivalent time to *stop*. § Passing time.

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them in their order, No. 1446, put on with a Great Northern crew on a night when the North Eastern engine had failed at Grantham, touched 74 m.p.h. before Newark, only fell to 55 at Markham Summit, and then reached 75 in descending to Retford, as a preliminary to the fastest time of the series from Retford to Bawtry, with its sustained speed of 70½ to 72½ m.p.h. on a little easier than level stretch. Then came signal delays, despite which York was reached in 91 min. (89 min. net), where a 30-sec. stop was made for a North Eastern pilotman, the Great Northern engine running through to Newcastle. But the running north of York was very poor, and ultimately we failed to maintain even our net time throughout. No. 1438, in the next column, ran right through in exactly the same circumstances, except that the North Eastern driver went on the footplate as pilotman at Grantham, and consequently, with a clear road through York, we were able to see what would be the unobstructed time contemplated by the non-stop schedule. Actually we took 5 min. 40 sec. over the 3·6 miles between Chaloner Whin and Poppleton Junctions, as against a general average on the other runs of 8 min. 10 sec. All three signal delays on this run were very slight; the running north of York was again poor, although one makes all allowance for a driver who has thus at short notice to take an express train over an entirely strange road.

The second effort of No. 1446 was on the pre-July 95-min. booking from Grantham to York, and resulted in a net gain of nearly 7 min., although a dead stand for adverse signals beyond Selby prevented us from actually improving on time. The start from Grantham was very rapid, with a maximum of 77½ m.p.h. before Newark, speed maintained across the Trent Valley to 65 at Carlton, where "even time" had been attained, a minimum of 52 at Markham, 74 before Retford, 67–69 all the way from Retford to Bawtry, and 51½ at Piper's Wood, after which the engine was eased, and nothing further of note was done. No. 285, in the fourth column, had the big 390-ton train hauled to Grantham by No. 1442, and got away with terrific *éclat*, passing Hougham at 74 m.p.h., and maintaining 82 (my first north-bound "eighty" at this point) for a mile near Claypole. We were still doing 68 at Carlton, did not fall below 49 at Markham, touched 71½ before Retford, maintained 64½ to 68 from there to Bawtry, and breasted Piper's Wood at 45½ m.p.h.,

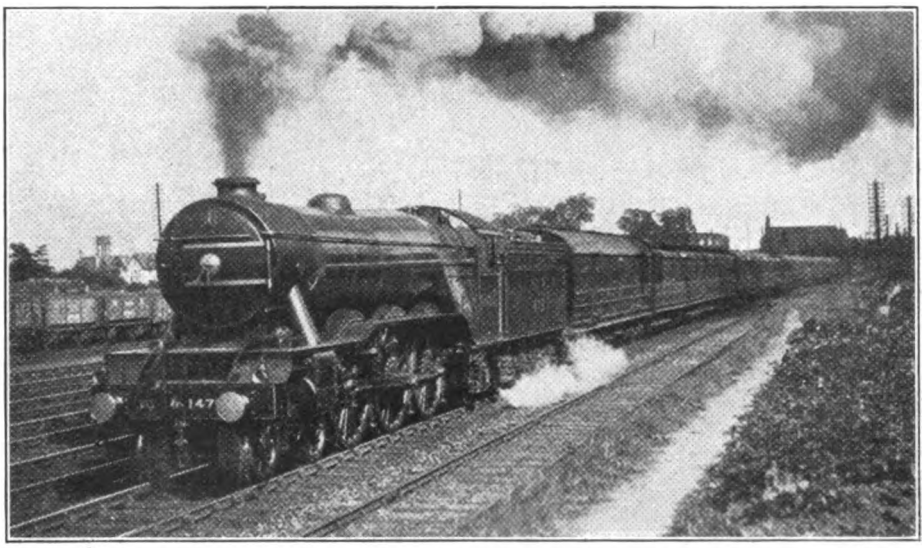

Photo.] **LONDON & NORTH EASTERN RAILWAY.** [*Henry L. Salmon.*

10.20 a.m. Newcastle–King's Cross Restaurant Car Express near York.
Great Northern 4-6-2 locomotive No. 1479.

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which notable work got this heavy train through Doncaster in less than 52 min.—a fine feat for a Great Northern "Atlantic." After this we took things quite easily, but still improved on time by 1½ min., despite concluding signal delays.

Now we come to the North Eastern efforts. No. 721 started well on her first trip, with a maximum speed of 79 m.p.h. near Claypole; minimum at Markham was 54 m.p.h., and maximum in descending to Retford 71½ m.p.h. The p.w.r. check beyond Retford was very severe for a full mile, and after this the best feature of the running was the recovery from Selby slack, which was observed, as usual, with considerably more caution than the 30 m.p.h. demanded by the ordinance. After the customary slack through York to walking pace, in order to set down the Great Northern pilotman, very feeble running ensued to Darlington, which was reached in less than a minute under schedule time. No. 736 got away more quickly still from Grantham, with a speed of 75 to 77½ m.p.h. all the way from Hougham to the Trent, and speed was still maintained at 71½ when we reached Carlton. Markham was topped at 52½ m.p.h., and we touched 71½ before Retford. After Doncaster we were brought to a dead stand by adverse signals at Arksey and very nearly so at Selby, losing by the two checks about 8½ min. But by rather more energetic running than usual north of York we only dropped 2½ min. in all on schedule, net time showing a gain of 8 min. An even faster start from Grantham was made by No. 727, again with a sustained speed of 75 to 77½ m.p.h. from Hougham to the Trent bridge, and a maintained speed of 71½ m.p.h. as far as Carlton. At Markham the minimum was 55 m.p.h., and the maximum before Retford was 75, though we eased to 64 through that station. Speed rapidly picked up again, however, to 69 at Sutton, 70½ at Ranskill and 70½ at Scrooby, after which came signal checks to Doncaster costing 3½ min. After Shaftholme speed was mostly above 60 m.p.h., and rose to 69 before we slacked for Selby, to 15 m.p.h. So the net time to York was 87 min., and by a slight further gain northwards we again economised 8½ min. net on schedule.

But the trip of trips was the last. It was certainly, by a substantial margin, the fastest journey I have ever made on Great Northern metals north of Grantham. Miraculously the road was clear until we were past Selby, where we were 4 min. inside "even time," and no less than *twelve minutes clear* inside schedule time!

Photo.] LONDON & NORTH EASTERN RAILWAY. [*H. Gordon Tidey.*

11.30 a.m. down train ex King's Cross.
Great Central 4-6-0 locomotive No. 1167, formerly "Lloyd George."

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Starting brilliantly out of Grantham, we were doing 75 m.p.h. at Hougham, and between that rate and 77½ on to the Trent, while the faint rise across the Trent Valley did not suffice to bring us below 74 by Carlton and 72½ by Crow Park. At Dukeries Junction we had dropped to 59 an hour, but recovered to 61 through Tuxford, and then topped Markham at 59—after 3¼ miles up at 1 in 200 and 1½ at 1 in 300. Down to Retford, strangely enough, we did not exceed 67 m.p.h., and through that station we slacked to 60; but then we got away again in magnificent fashion, reaching 70½ m.p.h. at Sutton, 71½ at Ranskill and 75 at Scrooby, on little easier than level track. This took us over Piper's Wood at a minimum of 61½ m.p.h., after which we touched 70½ before Doncaster, which was passed at a higher speed than usual. The engine was distinctly eased after this, but at Moss she was again "given her head," and got up to 65 m.p.h. at Balne, 68 beyond Heck, and 71½ before Selby slack, which was carefully observed at the 30 m.p.h. limit. Signal checks then supervened, at last, and to add to that, the engine ran "hot" at York and had to be detached. But to pass Selby, 68·9 miles from Grantham start, in 5 sec. over 65 min., was in ordinary service an unique feat; our average speed over the 60·1 miles from Barkstone to Templehirst, indeed, was 67·2 m.p.h. Redfern, of Gateshead, was the driver.

Removal of the engine at York, however, did not entail an end of this record running. No. 2172, in charge of Driver Hardgrave, of York shed, was waiting to take the 9.30 p.m. down, and so had only a light head of steam, as this was half-an-hour before his departure time. Consequently his start out of York was not brilliant, but by the time we were through Tollerton the engine was going in first-class style, while from Thirsk onwards we were beginning to break records. Neither the 1 in 626 from Thirsk up to Northallerton nor the 1 in 696 from Danby up to Eryholme (both steeper inclinations than those of the Great Western from Didcot up to Shrivenham) sufficed to bring us below 69 m.p.h., while the short level from Sessay to Thirsk produced 72½, the corresponding very faint descent from Northallerton to Danby 76½ (my "record" here in the down direction), and the modest descent from Eryholme to Croft 77½ m.p.h. Our average speed over the 31·8 miles from Tollerton to Croft, mostly rising even if but faintly so, was 69·6 m.p.h.—a simply superlative achievement—and given a normal start from York we could have made the journey in 42½ min. The combined net times of Great Northern No. 1478 and North Eastern Nos. 721 and 2172 on this occasion, with a clear passage through York as scheduled, and the usual 4 min. Grantham stop included, would have brought the train over the 232·3 miles from King's Cross to Darlington in precisely 4 hours, or 23 min. less than booked time.

L. AND N.E.R. (N.E. SECTION).

3-cyl. 4-4-2 Engine No. 2172.
Driver Hardgrave (York).
Load: 38 axles (264/280 tons).

Miles.		M.	S.	M.p.h.
0·0	York	0	00	¶
1·6	Poppleton Junction ..	4	20	—
5·5	Beningbrough ..	9	20	57½
9·7	Tollerton	13	25	67
11·2	Alne	14	45	68
13·4	Raskelf	16	40	69
16·1	Pilmoor	19	05	67
18·0	Sessay	20	45	69
22·2	Thirsk	24	25	72½
26·6	Otterington	28	05	71½
30·0	Northallerton ..	31	05	69
33·7	Danby Wiske ..	34	15	76½
37·2	Cowton	37	10	—
38·9	Eryholme	38	40	69
41·5	Croft Spa	40	50	77½
44·1	Darlington	44	15	—

¶ Maximum and minimum speeds, by chronograph.

I have reason to believe that a slightly faster run even than this was made from Grantham on another night by Driver Taylor, with No. 737, save that signal checks at Doncaster and through Selby prevented the making of so notable an end-to-end time. The guard's journal on the latter occasion gave 14 min. to Newark, 30 to Retford, 46 to Doncaster, 51 to Shaftholme, 68 to Selby, 89 to York, with 136 to Darlington, with 2 min. delay by signals at Doncaster, 4 min. at Selby, and 3 min. at York, but these figures must be accepted with a certain amount of reserve. So far as my own journey behind No. 721 was concerned, however, I felt very fortunate in having struck so auspicious a night, and I repeat, if repetition were necessary, that the times were not made with a view to

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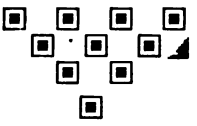
publicity, as the driver had no idea that his work was being recorded, any more than the other drivers whose work is set down here.

Obviously it is now impossible to enter upon details of further journeys, although I am sorry to have to exclude my records behind the big Great Central 4-6-0's on the Pullman trains. The principal feature of the work of No. 1165, *Valour*, was the fastest time I ever remember from Grantham to Peterborough—26 min. 50 sec.—with an average of 78·7 m.p.h. over the 15·2 miles from Corby to Helpston, and a well-sustained maximum of 85 below Little Bytham. We did Leeds to King's Cross with the full load (6 Pullmans and 2 brakes = about 300 tons) in 202 min. 25 sec., Doncaster to London in 163 min., Grantham to London in 109 min. 10 sec., and Peterborough to London in 82 min. 20 sec., despite severe signal checks at Ranskill and St. Neots, and easy running up from the station last-mentioned. On another occasion No. 1166, *Earl Haig*, broke a fresh record of mine by reaching 80½ m.p.h. at Carcroft, before Doncaster, and also repeated this maximum at Crow Park, but developed a slight defect after Grantham (passed in 92 min. 35 sec., despite a bad p.w. check at Retford) and had to come off the train at Peterborough. Time-keeping on the York non-stops appeared a simple matter; No. 272, with 270 tons, had signals badly on near Potters Bar, and severe p.w.r. checks at Huntingdon, Ripton, Corby and Escrick, but still reached a signal stop at Chaloner Whin Junction on time, in 206 min. 10 sec. from London. The finest achievement of this run was a time of 15¾ min. from Retford to Doncaster, with a top speed of 74 m.p.h. at Scrooby. The same engine had a much easier task still on the up journey, with only 190 tons, and gained a minute on schedule despite two signal checks to walking pace.

Of other up journeys the best were one behind No. 1406 on the up Newcastle morning express, when Peterborough was passed in 31 min. 40 sec. from Grantham, and King's Cross reached in 114 min. 35 sec.; another on the same express behind No. 1431, with 330 tons (42 axles), when London was reached in 117 min. 40 sec., despite two very severe p.w.r. checks costing 4¾ min., on a schedule of 120 min.; a trip behind "Pacific" No. 1474 hauling 365 tons on the relieving up day "Scotsman," when signal checks at Tuxford (walking pace), Grantham, Biggleswade, Harringay and Finsbury Park, with slacks over both Muskham and Werrington troughs, did not prevent us from cutting the 181-min. schedule to 173½ min. *gross* from Doncaster to King's Cross; and, finally, a glorious effort on the part of No. 1459, driven by Prior, on the 5.30 p.m. express from Leeds to London, when the 50·5 miles from Doncaster to Grantham were covered with 345 tons in exactly 55 min., the Grantham–Peterborough length in 33¾ min. (including a slack over Werrington troughs), and from Peterborough to King's Cross, with signals on at Arlesey, in 83 min. 50 sec., or 82½ min. net.

Before the year closes, I should like to take this opportunity of thanking the very numerous correspondents whose communications have helped to swell my post-bag almost daily during the past few months. Of such letters those dealt with in the present article are but a tithe; but it is quite impracticable for me either to find space for reference to each letter in these columns, or to find time for personal replies to the senders. At the same time, I would seek to assure all those who are kind enough thus to communicate with me that their remarks are read with unfailing interest, so far as I am concerned, and that I value them especially as tending to keep these articles accurately informed in regard to what is going on in all parts of the British locomotive realm.



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DEATH OF MR. H. A. IVATT,

Locomotive Engineer, Great Northern Railway, 1896-1911.

Photo.] [*Elliott & Fry*

WE regret to record the death, on October 25, of Mr. Henry Alfred Ivatt, Locomotive Engineer, Great Northern Railway, 1896–1911. Mr. Ivatt was born in 1851, served an apprenticeship at Crewe Works under the late Mr. J. Ramsbottom and the late Mr. F. W. Webb, spent six months in the traffic department of the London and North Western Railway under the late Mr. G. P. Neele, and was in charge of the locomotive departments at Holyhead and Chester. In 1877 he joined the Great Southern and Western Railway of Ireland, and became Chief Locomotive Engineer in 1886. In March, 1896, he succeeded the late Mr. Patrick Stirling as Locomotive Engineer of the Great Northern Railway. Between 1896 and 1911, when he retired, he was responsible for a wide variety of locomotive designs and for important developments which have had far-reaching influences upon modern locomotive practice.

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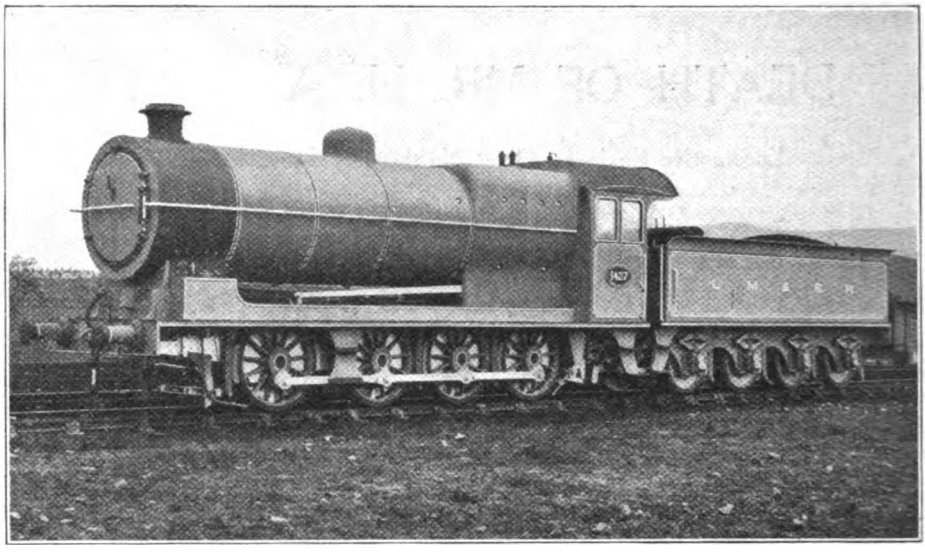

0-8-0 MINERAL LOCOMOTIVE, FITTED WITH NEW CAB, ETC.

Locomotive Developments on the London Midland and Scottish Railway.

BY courtesy of Mr. G. Hughes, C.B.E., Chief Mechanical and Electrical Engineer, and of Mr. H. P. M. Beames, Mechanical Engineer (Crewe), we are able to illustrate and describe two interesting developments in the locomotive practice of this railway. One illustration shows one of the latest 0-8-0 locomotives built at Horwich, including a cab of the type adopted for Mr. Hughes' 4-6-0 four-cylinder express locomotives, and certain other modifications. It will be noted that the engine bears a Lancashire and Yorkshire number and is lettered L.M. & S.R., though the locomotives will, in due course, be numbered and lettered in accordance with the system now adopted on the London Midland and Scottish Railway. In fact, we understand that one or two engines of the class are already at work numbered in that style.

The design is a development of that introduced in September, 1916, while the first to have the new cab was put in service in December, 1921. In general, these engines are used for the heavy mineral traffic of the Lancashire and Yorkshire section, on which duty they frequently haul trains of 1,000 tons behind the tender. Mr. Hughes' "Top and Bottom Header" design of superheater is fitted, while the piston valves have Mr. Hughes' automatic release valve for reducing excessive back pressure in the cylinders. The tender is of the 8-wheeled non-bogie type, utilising rolled steel disc wheels.

The second illustration shows one of the superheater 0-8-4 tank engines recently constructed at Crewe, of which several representatives, as already mentioned in our pages, are now in service. Some of them have now appeared lettered and numbered in the new style, though the particular engine illustrated is shown as it was turned out from Crewe works, the only evidence of grouping being the use of the letters L.M.S. on the sides of the water tanks.

This engine, which is an enlarged design of the 0-8-2 side tank shunting class built in December, 1911, was designed at Crewe in 1921. The outstanding features are: increased tank and coal carrying capacity, enlarged axleboxes, slide-bars and horn-blocks, addition of a superheater,

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lubrication of all journals by mechanical pump, and of cylinders by a "Detroit" displacement lubricator. The engine is fitted with a special design of reversing gear, enabling either wheel or lever to be used at will. The valves are actuated by the "Joy" gear. They have been built for mineral and local passenger working on the heavy gradients in South Wales, and below are given particulars of tests carried out in this district.

1. On a ruling gradient of 1 in 34 and bad weather conditions, the load taken behind the engine was 209 tons, consisting of 31 vehicles composed of 30 wagons and one 20-ton brake van. The load was started from rest with ease after the train had been brought to a stand on the gradient.

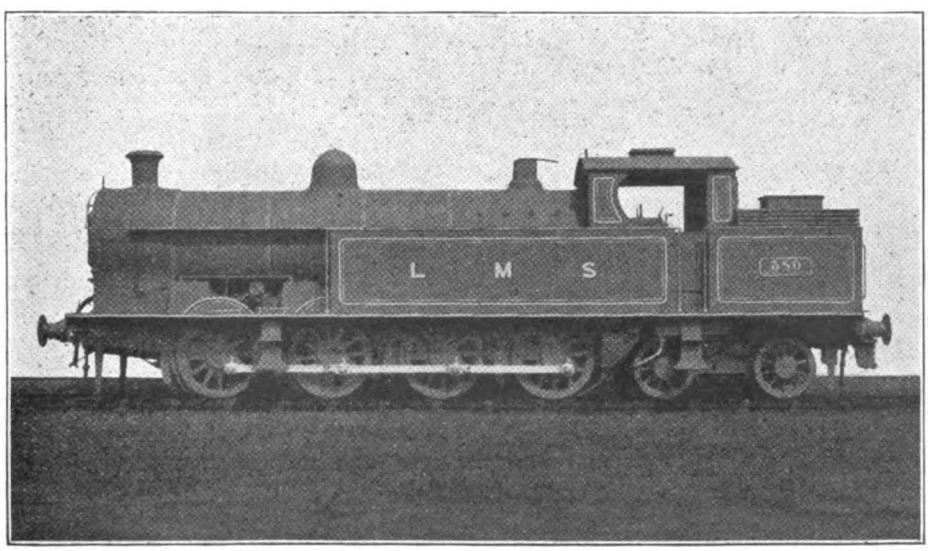
2. On a ruling gradient of 1 in 40, 392 tons behind the engine was taken under fine weather conditions, the train consisting of 59 empty wagons and one 20-ton brake van. This load was also taken with ease, and it was estimated that six more 12-ton wagons could have been taken, but, unfortunately, the road was such that the trap points would not allow of any extra length of train.

3. A passenger train working on a ruling gradient of 1 in 34 composed of 14 vehicles was taken behind the engine, the loading being 184 tons. This load was taken with ease, but no more coaches were added as, owing to the shortness of the platforms, had the extra length been added, the time taken owing to having to draw up a second time at each station, no gain would have accrued.

Nineteen of these engines are now working in the Abergavenny district and are doing the work of 30 coal side tank engines; 30 of these engines are being built.

Leading dimensions of the two locomotives illustrated are as follows:—

	0-8-0 *Tender*.	0-8-4 *Tank*.
Cylinders ..	21½ in. by 26 in.	20½ in. by 24 in.
Coupled wheels	4 ft. 6 in.	4 ft. 5½ in.
Steam pressure	180 lb. per sq. in.	185 lb. per sq. in.
Heating surface—		
Tubes ..	1,482 sq. ft.	—
Firebox ..	195 sq. ft.	—
Superheater ..	552 sq. ft.	—
Total ..	2,229 sq. ft.	2,046 sq. ft.
Grate area ..	25·6 sq. ft.	23·6 sq. ft.
Coupled wheelbase	16 ft. 4 in.	17 ft. 3 in.
Total wheelbase	44 ft. 7½ in.	29 ft. 3 in.
Water capacity	3,600 galls.	2,030 galls.
Coal capacity ..	5 tons	3½ tons
Adhesion weight	66 tons 4 cwt.	66 tons 10 cwt.
Total weight of engine in working order ..	66 tons 4 cwt.	88 tons.
Total weight of engine and tender in working order ..	107 tons 13 cwt.	—



0-8-4 HEAVY GRADIENT PASSENGER AND GOODS TANK LOCOMOTIVE.

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International Railway Congress, London, 1925.

As already mentioned, the next session of the International Railway Congress Association is to be held in London during 1925. At a meeting of the Permanent Commission of the Association, held at Brussels, it was reported that the Local Organising Committee of the London Congress was composed as follows :—.

The Right Hon. Sir Evelyn Cecil, G.B.E., M.P., Director, Southern Railway (Member of the Permanent Commission of the Association).

Mr. G. Behrens, Director, London Midland and Scottish Railway (Member of the Permanent Commission of the Association).

Mr. F. J. C. Pole, General Manager, Great Western Railway.

Mr. Arthur Watson, General Manager, London Midland and Scottish Railway (Member of the Permanent Commission of the Association).

Mr. R. L. Wedgwood, Chief General Manager, London and North Eastern Railway.

Sir Herbert Walker, General Manager, Southern Railway (South Western Section).

Sir Henry Fowler, Deputy Chief Mechanical Engineer, London Midland and Scottish Railway.

Mr. Roger T. Smith, Electrical Engineer, Great Western Railway.

Mr. F. A. Brant, Continental Traffic Assistant, Southern Railway.

Secretary : Mr. Arthur B. Cane, Secretary of the Railway Companies' Association.

Sir Herbert Walker, Sir Henry Fowler, Messrs. Pole, Wedgwood, Smith, Brant and Cane have been, in accordance with Article 6 of the Statutes, made temporary members of the Permanent Commission.

It was also announced that other Englishmen will shortly be appointed on the Local Organising Committee. In an appendix to the October issue of the *Bulletin of the International Railway Congress Association*, particulars are given of the questions for discussion at the London session. The following British railway officers are associated as reporters.

Section 1.—Way and Works.

I.—Maintenance of the Track. Level Crossings (Public Roads).

Reporter—Great Britain and Colonies: Mr. W. H. Coomber, Divisional Engineer (Permanent Way), London Midland & Scottish Railway.

II.—Breaking of Rails. Joints.

Reporter—Great Britain and Colonies: Mr. C. J. Brown, Chief Engineer, Great Northern and Great Central Sections, Southern Area, London & North Eastern Railway.

III.—(Sections 1 and 3 jointly)—Shunting Yards.

Reporter—Great Britain and Colonies: Mr. R. H. Nicholls, Superintendent of the Line, Great Western Railway.

Section 2.—Locomotives and Rolling-Stock.

IV.—Reduction of the Cost of Traction.

Reporter—Great Britain and Colonies: (A.) Mr. C. B. Collett, Chief Mechanical Engineer, Great Western Railway; (B.) Sir Henry Fowler, Deputy Chief Mechanical Engineer, London Midland & Scottish Railway.

VI.—(Sections 1 and 2 jointly)—Locomotive Sheds.

Reporter—Great Britain and Colonies: Mr. R. E. L. Maunsell, Chief Mechanical Engineer for Locomotives, Carriages, Wagons and Road Vehicles, Southern Railway.

Section 3.—Working.

VII.—Dispatching or Control Systems.

Reporter—Great Britain and Colonies: Mr. J. H. Follows, Chief General Superintendent, London Midland & Scottish Railway.

VIII.—Suburban Services.

Reporters—America, Great Britain and Colonies: Mr. H. E. Blain, Assistant Managing Director, and Mr. A. R. Cooper, Chief Engineer, Metropolitan District Railway, and other London Underground Railways.

IX.—(Sections 2 and 3 jointly)—Fixed Signals.

Reporter—Great Britain and Colonies: Mr. W. J. Thorrowgood, Signal and Telegraph Superintendent, Southern Railway.

Section 4.—General.

X.—The Eight-hour Day.

Reporter—America, Great Britain and

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Colonies: Mr. W. Clower, Assistant to General Manager (Staff and Labour), London Midland & Scottish Railway.

XI.—STATISTICS.

Reporter—Countries outside America: Mr. A. E. Kirkus, Director of Statistics, Ministry of Transport (Great Britain), 7, Whitehall Gardens, London, S.W.1.

XII. (SECTIONS 3 AND 4 JOINTLY)—JOINT STATIONS AND LINES.

Reporter—America, Great Britain and Colonies: Mr. R. Cope, Chief Accountant, Great Western Railway.

Section 5.—Light Railways and Colonial Railways.

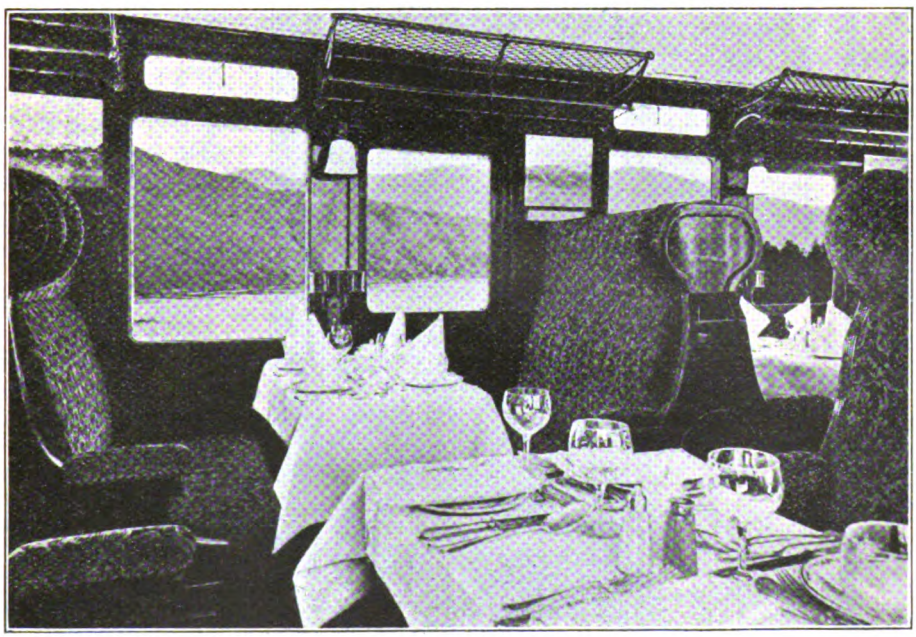
XIII.—ESTABLISHMENT OF LIGHT RAILWAYS.

Reporter—America, Great Britain and Colonies: Mr. H. Marriott, Assistant to General Manager, London Midland & Scottish Railway.

XV.—TRACTION FOR LIGHT RAILWAYS.

Reporter—America, Great Britain and Colonies: Lieut.-Colonel H. O. Mance, C.B., C.M.G., D.S.O., R.E., late Director of Railways, Light Railways and Roads, War Office.

NEW PASSENGER ROLLING-STOCK BUILT AT DERBY, LONDON MIDLAND AND SCOTTISH RAILWAY.



INTERIOR OF NEW COACH SET FOR DINNER.

(*See Article on* "Mass Production of Railway Carriages," *page* 432.)

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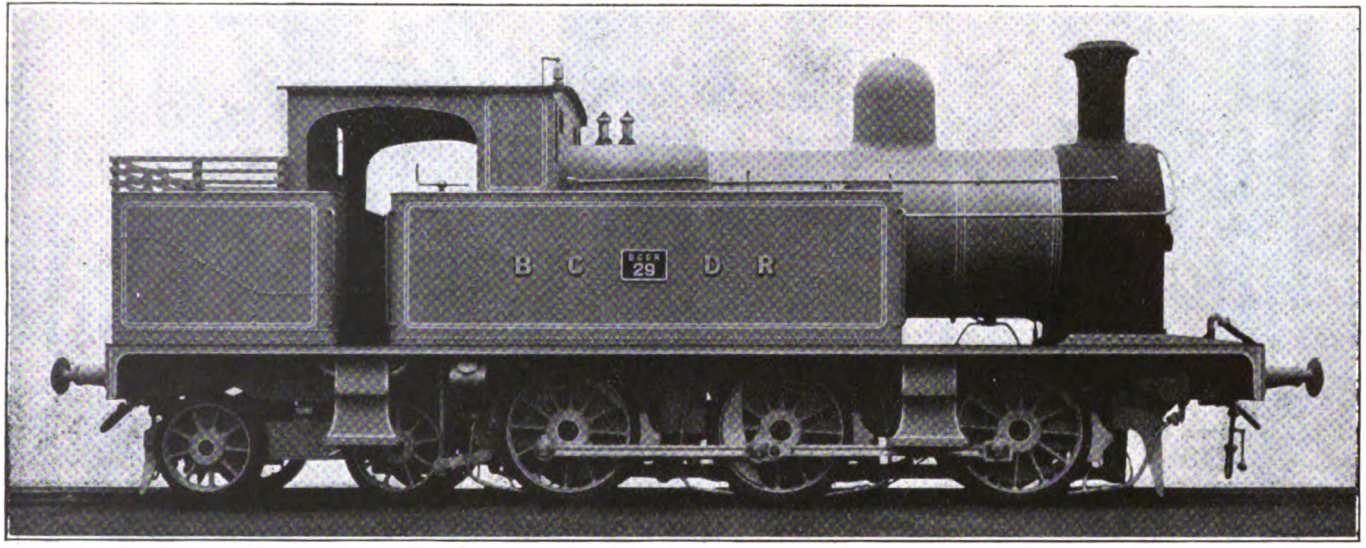
0-6-4 TANK ENGINE, BELFAST & COUNTY DOWN RAILWAY.

Designed by Mr. J. L. Crosthwait, Locomotive Engineer, and Built by Messrs. Beyer, Peacock & Co. Ltd.



THE engine illustrated has been specially designed to be able to take curves of 170-ft. radius, for which purpose the leading axle boxes are provided with ½-in. play on each side, the leading coupling rods are fitted with self-aligning bushes, and the bogie has a play of 5 in. each way. The boiler has a diameter of 4 ft. 4$\frac{13}{16}$ in., and contains 189 tubes, having an outside diameter of 1$\frac{7}{8}$ in. Leading dimensions are as follows :—Cylinders, 17 in. by 24 in. ; coupled wheels, 4 ft. diam. ; bogie wheels, 3 ft. diam. ; coupled wheelbase, 12 ft. 6 in. ; total wheelbase, 22 ft. 8 in. ; heating surface :—tubes, 969 sq. ft. ; firebox, 95 sq. ft. ; total, 1,064 sq. ft. ; grate area, 18 sq. ft. ; water capacity, 1,350 gallons ; coal capacity, 3 tons ; weight of engine in working order, 55 tons 10 cwt.

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RAILWAY MAGAZINE *readers desiring information should mark envelopes "Query" in the upper left-hand corner, and address them to the Editor. Questions relating to the dimensions and weights of railway rolling-stock and to names, numbers, dates, etc., of locomotives should not be forwarded. No reader should send more than two questions in one month. Correspondents are requested to write on one side of the paper only, and although they must give their names and addresses, pen-names or initials may be inserted for Editorial use. Before asking for information concerning railway history or "grouping," the pages of the "Railway Year Book." should be consulted. The twenty-sixth Annual Edition* (1923) *of this standard railway reference work is on sale at 5s. net. or by post from the* RAILWAY MAGAZINE *Offices, 33, Tothill Street, Westminster, London, S.W.1, 5s. 6d., Overseas, 5s. 8d.*

Scottish Summer Train Services.

The 10 a.m. from Edinburgh to King's Cross, on its summer schedule, is not non-stop from Edinburgh to Darlington, as a daily halt is made at Newcastle (Central) for changing engines and train examination. The conditional stop at Dunbar on the 7.35 p.m. from Aberdeen to King's Cross was seldom made, and so was not noted in the table. There has never been a non-stop run in force from Aberdeen to Edinburgh—it is doubtful, indeed, whether a North British tender would carry sufficient water to enable such a run to be made in ordinary service—and you are doubtless confusing this with the fact that the up evening Aberdeen "sleeper" to London for one post-war summer ran daily non-stop from Arbroath to Edinburgh. We cannot agree with you as to the timings between Edinburgh and Aberdeen; as was fully detailed in Mr. Cecil J. Allen's article of January last, this is a route of most exceptional difficulty, over which the locomotive work performed, even in bare timekeeping, is generally of a very high order. Additional stops at Dalmeny, of up to 6 min. per express carrying a Glasgow portion, more than account for the slight end-to-end decelerations of the present year.

[Reply to F. A. BIRKETT.]

Main Routes, L.M.S.R. (Caledonian Section).

Travelling northward from Carlisle, Edinburgh trains leave the main line at Carstairs, and Glasgow trains (for the Central station) at Law Junction, whence the north main line proceeds by Holytown, Mossend, Coatbridge and Glenboig to Larbert and Stirling, *en route* to Perth and Aberdeen. North-bound trains from Glasgow start from the Buchanan Street station, joining the above route at Glenboig, though one down and two up expresses take the longer route via Coatbridge from and to the Central station. Edinburgh trains for the North start from Princes Street, as for the South, but follow the North British main Edinburgh-Glasgow line from Haymarket West Junction to Polmont, and then run down through Falkirk to join the North main line at Larbert. From Perth the main route is via Forfar and Stonehaven. Carlisle-Perth trains can also travel from Law Junction to Mossend via Motherwell.

[Reply to "SILURIAN."]

Rolling-stock under Grouping.

Notwithstanding official announcements as to the liveries to be adopted for both locomotives and rolling-stock by the new companies, on some lines vehicles are

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still being sent out from the works painted in the old standard colours, usually minus crests and other elaborations. These represent, we understand, the completion of work for which instructions were given before the new colours were decided upon. They also serve to use up reserves of colours which will not be required under the new practice. Although statements have been made that Southern Railway rolling-stock is to be painted green, and several trains (including new sets) have appeared thus painted, and lettered "Southern Railway," no official announcement has yet been made. In fact, in some respects, statements which have so far appeared are more or less contradictory.

[Reply to W. E. IKIN and others.]

Continuous Engine Workings.

Continuous working, with only very occasional exceptions, of 4-6-0 G.W.R. engine No. 2915, *Saint Bartholomew*, on the up Cheltenham express which makes the 75-min. run from Swindon to Paddington, though doubtless a record in regard to daily working on so high-speed a service, is not yet a record for continuous day-to-day working on the same train. The 2-4-0 London and North Western engine No. 955, *Charles Dickens*, now long since scrapped, made a daily return journey by the 8.30 a.m. from Manchester to London and 4.5 p.m. from Euston back to Manchester—a round mileage of over 370 daily, *via* Stoke—with only occasional intervals for routine repairs and overhaul, until a record total mileage of over 2,000,000 had been attained.

[Reply to J. R. SANDERS.]

L.M.S. (Midland) Locomotives.

We understand that a few of the London, Tilbury and Southend 4-4-2 tank engines are also used on St. Pancras services, apart from those to and from Southend. Otherwise, we have no knowledge as to their use elsewhere. We cannot undertake to point out particular issues in which Mr. Allen dealt with locomotive performance on individual sections of the various railways. Usually every important main line, together with many secondary and cross-country routes upon which express trains are operated, receives attention at least once, if not more often, in the course of twelve months. Your kind remarks in reference to the RAILWAY MAGAZINE and the "Notable Railway Station" articles are appreciated.

[Reply to "JOULE."]

Willesden Junction High-Level Station, L.M. and S.R.

To improve the facilities at Willesden the single platform at the High Level station on the down side opposite the island platform has been adapted to accommodate electric trains between Willesden and Earl's Court. Access for passengers to and from the new platform for the Earl's Court trains is by means of a footbridge connected with the island platform. These new facilities will enable the trains to and from Earl's Court to be dealt with without interference with the trains between Broad Street and Richmond. No intimation has yet been made as to electrification of the Poplar branch.

[Reply to "WILLESDEN ONLY."]

London Midland and Scottish Lines at Market Harborough.

Physical connection exists between the Midland and North Western lines, but not adapted at present for direct through running; in any case, the platform accommodation at Euston is already more than sufficiently taxed to allow of the reception of Midland express trains in addition, if the latter were diverted *via* Northampton and Bletchley, an increase of ¾-mile in distance. Through goods running (with Midland engines) is, however, already taking place *via* the historic Leicester and Rugby route (which first gave the Midland access to London) to and from Willesden; by this route the Midland distance between Leicester and London is increased by 3½ miles.

[Reply to BRIAN BRAMALL.]

Speed on Narrow-Gauge Railways.

Speeds of 40-45 m.p.h. on 3-ft. gauge lines, and of 50-55 m.p.h. on 3-ft. 6-in. gauge lines are by no means exceptional. In fact, in both cases, even higher speeds have been recorded on occasions. For narrow gauges 20-30 m.p.h. would probably be a permissible maximum. Railways of these gauges are generally built under conditions which involve a combination of severe gradients and sharp curves, so that while it might be quite safe to travel at appreciably higher speeds, the conditions usually preclude other than

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moderate speeds in order to ensure safety on curves and in descending steep gradients.

[Reply to K.W.A.]

London Midland and Scottish Postal Trains, Caledonian Section.

The 3.25 p.m. from Aberdeen to the South is the up West-Coast postal train; by arrangement with the Postmaster-General, as the postal portion is light between Aberdeen and Perth, a strictly limited number of passenger coaches are added to the formation for the use of ordinary passengers. This accounts for the note you have seen in the time-tables to the effect that bicycles and heavy luggage are not conveyed, while passengers only are admitted conditionally on there being room. The same conditions apply to the 4.15 a.m. from Glasgow to Aberdeen, which joins the down postal at Stirling.

[Reply to E. W. F. MANCHESTER.]

Italian Signalling.

Signalling on the Italian State Railways is in many respects similar to our own, so far as the actual semaphores are concerned. It is a frequent practice in Italy, however, to fix the distant signal-arm on the same spindle as the stop arm on one post; there are then three indications—home and distant both "on" for "danger"; home "off" and distant "on," for caution; and home and distant both "off" for caution—roughly corresponding to those of a three-position signal, and the distant arm is only visible when the caution indication is displayed. This is doubtless why you noticed no fish-tail arms in use.

[Reply to J. C. F. Ll. W.]

Fares via the Severn Tunnel.

It is nothing unusual for a railway company to be granted statutory permission to charge extra fares over a route in respect of very costly works undertaken in the construction of the route concerned, especially when the journey to towns reached by the route in question has been shortened thereby. The treatment of the Severn Tunnel as 8 miles in length for fare-charging purposes, instead of the actual 4¼ miles, is a case in point. Another well-known instance is the high-level bridge over the Tyne at Newcastle, treated as 3 miles instead of half a mile.

[Reply to "SILURIAN."]

Corringham Light Railway.

This is a short railway, opened in 1906, to connect the village of Corringham with Kynochtown. It has no direct connection with any other railway, but is not far from the London, Tilbury and Southend section of the L.M. & S. Railway at Stanford-le-Hope, in Essex. Length is 2¾ miles, and it has two locomotives, 12 coaching vehicles, and two goods vehicles. Brief particulars are included in the *Railway Year Book*. Passenger trains are operated, though particulars are not given in *Bradshaw*.

[Reply to H. MIALL.]

North British Trains at Newcastle.

For a great many years certain North British services have worked through to Newcastle from Riccarton via Hexham, and thence over the Newcastle–Carlisle lines. Those working the branches from Morpeth did not run through to Newcastle, nor has it ever been usual for North British locomotives and rolling-stock to work south of Berwick. Under grouping, however, there have been occasional instances of their doing so, and further changes in this respect are to be anticipated in the future.

[Reply to "HALLAMSHIRE."]

Yellow Distant Signals.

In conjunction with the use of yellow spectacle glasses for the "caution" indication of distant signals, various railways, including the Great Northern section of the London and North Eastern Railway, are in places, if not generally, painting the faces of distant signal arms yellow instead of red, as usual. This is in accordance with the principle that the adverse indication of a distant signal is "caution" and not "danger," as in the case of signals for which red will presumably, and with distinct appropriateness, be reserved in future signalling practice.

[Reply to G. E. BIGMORE.]

Locomotive Coasting.

It might be possible for a driver of a heavy express train, if travelling at, say, 70 miles an hour, to "coast" for as long a distance as 6 miles on a level track after shutting off steam, but the speed at the end of the distance would be very low indeed, and you may take it as certain

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that such a practice is neither in vogue on the Great Western Railway nor on any other line. We have no definite information as yet on the other point you raise.

[Reply to " THANET LIMITED."]

Belfast & County Down Railway.

Mr. C. A. Moore, General Manager, informs us that 2-4-0 tender engine No. 6 is still used for main line duties, but Nos. 23 and 25 have been scrapped. Of the 4-4-2 compound tank engines, Nos. 18, 19, 21 and 22 have been scrapped, but are replaced by 4-6-4 tank engines Nos. 22 to 25, which are exclusively used on the Bangor branch service. Two goods trains are required to work main line traffic from Belfast, one serving stations from Downpatrick due to arrive at Newcastle at 12.50 a.m. and to depart at 1.50 a.m., the other working as far as Downpatrick station only.

[Reply to W. R.]

Election Traction in New York.

Mr. R. W. A. Salter mentions that the New York Central and Hudson River Railroad has a line entering Manhattan proper, over which some trains operate. This line runs parallel to Riverside Drive. He also remarks that this line is regarded as a great eyesore and is used by thousands of people as a footpath, notwithstanding the railroad traffic. He states further that trespassing is very common, even on the electrified lines.

[Further reply to F. B. P.]

Great Western Engines Painted Crimson.

During the time that crimson lake was standard colour for Great Western coaches, a few 0-4-2 and 0-6-0 Great Western tank engines were painted lake for use in auto-train or " push-and-pull " train formations, in order that they might match the coaching stock, and these are doubtless the engines you have seen.

[Reply to " READER."]

Great Western Engine Sheds.

We believe the new 4-6-0 engine No. 4073, *Caerphilly Castle*, is attached to Old Oak Common shed. It is always possible, however, that by the time a reply is published a particular engine has been shifted, for which reason we cannot, in general, give information as to the sheds to which individual locomotives are attached.

[Reply to D. V. HART.]

Piloting.

It is pointed out by Mr. Cecil J. Allen that " Atlantics " are never used as pilots to Potters Bar, so that, in the case mentioned, the 4-4-2 was the train engine, the assisting 4-4-0 being placed next to the train on the principle that as the " Atlantic " was the train engine its driver retained full control, although having an assisting locomotive.

[Further reply to A. C.]

Beccles and Haddiscoe Swing Bridges, London and North Eastern Railway.

Pilotmen are necessary at both of these bridges, owing to the convergence of the double line to single in crossing them. The contemplated renewal as double-track bridges is both for purposes of strengthening and also to do away with these serious hindrances to traffic operation on the main line concerned.

[Reply to " WYCOMBITE."]

Midland Train Control.

An L.M.S.R. stationmaster points out that the abbreviations of departure and destination names used for train control purposes mentioned, have now been replaced by a code utilising single letters in the case of trains running between certain depots. The method of indicating times by code letters remains unaltered. We hope to refer further to the former code in due course.

[Further reply to K. A. WERRETT.]

Furness Section Locomotives, London Midland and Scottish Railway.

Through running of these engines to and from Maryport and Carlisle was by no means unusual, even before grouping changes took effect, but is now a regular practice, Furness engines and men working through to and from Carlisle daily on both passenger and goods turns.

[Reply to T. POSTLETHWAITE.]

Rail-lengths.

On all main line sections of the Southern Railway the standard length of rail is 45 ft., but considerable stretches of 30-ft.

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rails may be found in places. The Great Northern section of the L. & N.E.R. uses chiefly 45-ft. rails, but there are lengths of 36-ft. rails in places, and occasionally 60 ft. and 30 ft.

[Reply to "X."]

Shepreth Branch Junction, London & North Eastern Railway.

We are advised that down passenger trains cannot be accepted by Shepreth Branch Junction Box (near Shelford) from Harston under the warning arrangement "Section Clear but Junction Blocked." The section thence to Shelford is, however, a short one, so that the road is not blocked for long periods at the junction.

[Reply to H. W.]

L. and N.E. Summer Service, London-Glasgow.

Fastest time was by the 8.20 p.m. from King's Cross, due Edinburgh 4.5 a.m., and thence by 4.30 a.m. to Glasgow, due 5.30 a.m., total 9 hours 10 min., as correctly shown in the Summer Train Services article in our October issue. This was not, however, an advertised service.

[Reply to J. C. SEARLS.]

Isolated Railways.

We know of no *standard* gauge railway in Great Britain which is physically isolated from the main railway system of the country, *i.e.*, that lacks actual connection with one of the larger lines, in the same way as the Waterford and Tramore Railway in Ireland, to which you refer.

[Reply to D. B. B.]

Speed Restriction Signs, Belgian State Railways.

We are reminded that the boards mentioned indicate the approach to distant signals and not necessarily to junctions. Their purpose is to enable drivers to judge their distance from the distant signals in the foggy weather to which Belgium is peculiarly subject.

[Further reply to A. L. B.]

London and North Eastern Railway (Great Central) Locomotives.

Tractive effort, at 85 per cent. working pressure, of the "Sir Sam Fay" class 2-cylinder 4-6-0's is 20,180 lb., and of the latest 2-cylinder 2-8-0's 31,330 lb. The large 3-cylinder 0-8-4 banking tank engines are numbered 1170–1173 inclusive.

[Replies to P. G. D. J. and J. SEWARDS.]

4-6-4 Tank Tractive Efforts.

In order of tractive effort, calculated by the usual formula, the G. and S.W. type comes first, the Brighton second, the Furness third and the Midland (L.T.S.) fourth. Actual figures, at 85 per cent. working pressure, are 26,740, 24,175, 21,010 and 18,860 lb, respectively.

[Reply to "STEPHENSON."]

Locomotives West of Exeter, Southern Railway.

Heavy 4-6-0 classes of the South Western section, although well suited to the severe gradients west of Exeter, are precluded from running over this route owing to their weight being excessive for certain underline bridges and viaducts.

[Reply to D. A. BECKETT.]

Exceptional Railway Facts.

We are unable to say where is the deepest railway cutting or the highest railway embankment on the world's railways, but many interesting facts on these lines are mentioned incidentally in Mr. J. F. Gairns' *Railways for All*, of which particulars appear in our advertising pages.

[Reply to T. W. LINSELL.]

L. & N.E. Coach Numbering.

Suffix "Y" after the coach number indicates the coaching stock of the North Eastern section. We have noted already that the horse-boxes, carriage-trucks, passenger-fitted goods vehicles, and wagons in this group bear the abbreviated lettering "N.E."

[Reply to S. SHIRLEY.]

Edgware Extension, London Electric Railway.

This undertaking, which is now on the verge of completion, was opened for public traffic as between Golders Green and Hendon on November 19. It will be fully described in the January RAILWAY MAGAZINE.

[Reply to H. S. HACK.]

London Midland and Scottish Locomotives.

Mr. G. White points out that, in the previous reply, the power classification numbers adopted for Midland locomotives were reversely stated, No. 1 class being the lowest and No. 4 the highest.

[Further reply to P. R. B. (Leeds).]

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Piloting on L.N.E.R. (N.E. Section).

There has been a considerable increase of piloting recently on this section, the rule being now to pilot any express with more than twelve vestibuled bogie vehicles. The 8 a.m. from Newcastle to York is thus piloted daily.

[Reply to R. D. LUND.]

Signalling at Beckenham Junction.

Mr. C. E. Perkins explains that No. 1 signal mentioned in the previous reply protects the junction in the down direction with the Norwood Junction spur line, and is not an outer home signal as suggested by the sketch submitted by our querist.

[Further reply to " S.E. & C. SIGNALS."]

Distant Signals, London and North Eastern Railway (Great Northern Section).

We were already aware that the Great Northern authorities have substituted yellow for red as the standard colour for distant semaphore arms and lights, but thank you for your information.

[Reply to A. SHIRLEY.]

London and North Eastern 4-6-2 Locomotives.

There are now twelve engines of the Great Northern class in service, numbered 1470-1481 inclusive. Your original query did not give the impression that this was the information you desired.

[Reply to J. R. I.]

Great Western Railway Engines at Manchester.

Mr. F. Smith points out that, although the " Moguls " are precluded from working into Exchange, they do work trips beyond Patricroft into and out of Liverpool Road goods station.

[Further reply to S. RICHARDS.]

L.N.E.R. (G.N. Section) Locomotives.

Condensing apparatus of 4-4-2 tank engines is removed as they go into Doncaster Plant Works for overhaul. 0-6-0 goods engines of the " 521 " class were superheater-equipped when built.

[Reply to A. C.]

" Tilbury " Section, L.M.S. Railway.

Mr. Cecil J. Allen remarks that no 4-6-4 tank engine has ever entered Fenchurch Street station, thus confirming the reply which we gave in slightly less definite terms.

[Further reply to L. J. POWER.]

Locomotive Chimneys.

Stovepipe type of chimney at present in use on the South Western section of the Southern Railway has been chosen for a standard as being economical to manufacture and maintain.

[Reply to WALTER TAYLOR.]

Midland Great Western Railway (Ireland) Locomotives.

Apparatus you have noted on 0-6-0 No. 53, *Duke*, is the Morton-Cusack superheater, mounted above the firebox, and fittings with which this engine has been rebuilt.

[Reply to " GALTEE MORE."]

Opening of New Lines.

No information yet available as to the inauguration of passenger traffic on the Cuffley–Stevenage line, London and North Eastern Railway, or the Torrington–Halwill Light Railway.

[Reply to " BARUM."]

South Eastern and Chatham Train Speeds.

Obviously high speeds cannot be expected between Holborn Viaduct and Herne Hill, and it is doubtful whether anything over 40 m.p.h., if as much, is ever attained.

[Reply to " SUBSCRIBER."]

Traffic Working at Worcester.

Mr. Cecil J. Allen states that the working suggested was that definitely adopted, the 11.26 a.m. train from Worcester carrying the East Coast destination boards throughout.

[Further reply to R. A. ATTHILL.]

Railways of Syria and Palestine.

Certain lines, including the Jaffa-Jerusalem and some of the railways in Asia Minor have been dealt with in the RAILWAY MAGAZINE, but not in recent issues of which copies can be supplied.

[Reply to " HEDJAZ."]

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LOCOMOTIVES AND ROLLING-STOCK AT THE CANADIAN NATIONAL EXHIBITION.

WE are indebted to Mr. C. J. Penney for the two photographs reproduced above, showing the exhibits, respectively, of the Canadian Pacific and Canadian National Railways. The exhibition, which was held at Toronto, is an annual event and ranks as one of the most remarkable of its kind. Upwards of a million and a-half people visited the exhibition this year.

The Canadian Pacific Railway train (upper view) consisted of five all-steel cars of latest design and steel baggage car (next engine), headed by a new " Pacific " type locomotive. The public were invited to inspect every detail of engine and train, steps being provided to enable visitors to climb on to the footplate of the engine and also into the cars. The Canadian National Railway engine (lower view) is one of 15 new productions of the Canadian Locomotive Company, Kingston, Ontario, to be used on the Montreal-Toronto trains, and also on some of the heavier trains in the Maritime Provinces. They are to run between Toronto and Montreal without coming off the train—333 miles. They are of the " Mountain " or 4-8-2 type. The first engine of this class was illustrated in the September RAILWAY MAGAZINE, when full dimensions were given. The semi-circular sign over the smokebox is affixed for exhibition purposes only. A temporary track had to be laid to get this huge engine into the exhibition grounds. The car alongside is a postal sorting van, also on exhibition.

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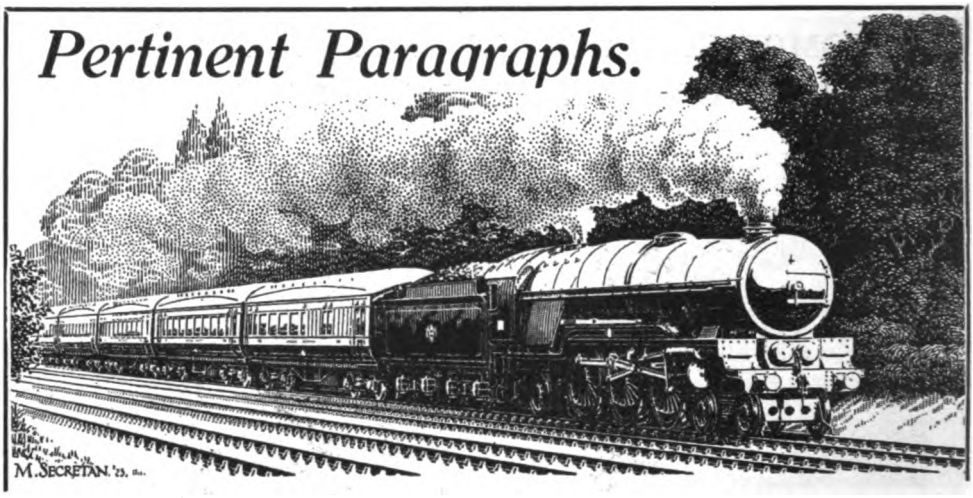
Pertinent Paragraphs.



Three Proposed Railways.

FOR a considerable period deputations of local representatives, including several members of Parliament, have urged the Great Western Railway to undertake the construction of new railway lines to serve the following districts :

	Estimated cost.
Fairford to Cirencester ..	£321,000
Mathry Road to St. Davids	£350,000
New Radnor to Trawscoed	£1,750,000

Viscount Churchill, Chairman of the Company, states that while there is no doubt that the proposed lines would encourage local development, the areas affected are such that from a purely commercial standpoint the cost of construction cannot be justified. Government assistance is essential, he adds, if the suggested railways are to be constructed, as there appears little prospect, for a considerable time to come, of the receipts from the lines being more than sufficient to cover working expenses. Moreover, in two of the cases, *i.e.*, Fairford to Cirencester and New Radnor to Trawscoed, there would be loss of revenue owing to the shortening of the railway routes. For example, the Fairford to Cirencester line would give a through railway between Oxford and Gloucester, thus reducing the mileage by rail between the two cities, with consequent loss of revenue to the company. In the case of New Radnor to Trawscoed the effect would be still more far-reaching, as it would entail a big cut in the mileage between London and Aberystwyth and consequent reductions in railway rates and fares between the Metropolis and the Cardigan coast.

The proposed line from Mathry Road to St. Davids would carry rail service to the only cathedral city in Great Britain at present without it. Whether this would be an advantage or the reverse from the point of view of the ecclesiologist it is not for us to discuss, but there is no doubt the advent of the railway would produce much development in St. Davids and that hotel and other building would result.

The Institute of Transport.

THE Annual Report of the Council for the year ended September 30, 1923, recently issued, shows that the notable progress made during the first three years of the Institute's existence has been fully maintained during the fourth year. In the first place the Council records its appreciation of the fact that H.R.H. The Prince of Wales, K.G., K.T., has graciously assented to accept the office of Honorary President, and expresses also recognition of the services rendered during the years 1921-2-3 by the Right Hon. Lord Ashfield, of Southwell, P.C., the retiring Honorary President. Mr. F. Tatlow, C.B.E., late General Manager, Midland Railway, was elected a Vice-President, in place of Sir Henry Thornton, K.B.E., who, however, retains his membership of the Institute. Messrs. W. H. Gaunt, O.B.E., and S. A. Parnwell, Divisional General Manager, Southern Area, London and North Eastern Railway, were elected Honorary Members of the Council.

Reference is made to the Congress held at Sheffield, June 14-16, and to the arrangements in progress for next year's Congress at Bristol. A reading room for members has been provided and furnished at headquarters. On September 30, 1923, the membership resident within the United Kingdom and resident outside the United Kingdom was as follows :—Members, 496-89 ; Associate Members, 300–52 ; Associates, 3–1 ; Graduates, 507–22 ; Students, 154–12 ; total, 1,636. The Report further reviews

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the work of the year, the awards of premiums, and outlines arrangements for the 1923–24 session. The work of the North Western Local Section and of the Metropolitan Graduate and Student Society is also reviewed. At the close of the year Mr H. E. Blain, C.B.E., Assistant Managing Director, Metropolitan District Railway and associated companies, relinquished the office of Hon. Secretary, which he had filled from the foundation of the Institute. Mr. A. Winter Gray became, as from October 1, the first Secretary of the Institute. The financial situation, as shown by the balance-sheet, is entirely satisfactory.

The Institute's Examination Scheme.

We have also received a copy of a pamphlet setting forth the regulations and syllabuses of graduateship and associate membership (Traffic Section) examinations and particulars of exempting examinations for studentship. These come into force on October 1, 1925. The pamphlet indicates the qualifications required for admission to each grade, and outlines the scope of the examinations which will be arranged in due course. Suitable textbooks under each heading are mentioned. The scheme, as a whole, was very fully explained by Mr. Philip Burtt, Member of the Council, in a lecture delivered to graduates and students on Tuesday, October 16. The aims of the scheme were thus set forth :—

1. To outline courses of study for those who desire to succeed to higher responsibility in the transport world;
2. To indicate lines upon which specialised instruction in transport subjects may be given;
3. To encourage research and widen the field of investigation and application of transport science, and
4. To afford the individual an opportunity, not previously available, of furnishing evidence of having acquired a knowledge both of the fundamental principles of transport and of their practical application.

The programme for the 1923–24 session necessarily has to pay attention to all forms of transport. The following are the principal papers of direct railway interest :—

Ordinary Meetings :—

December 3, 1923.—" Railways of To-day and To-morrow." Mr. C. Travis, Associate Editor, *Railway Gazette*.

April 7, 1924.—" Organisation of Traffic and Locomotive Departments in Relasion to Running." Mr. H. A. Watson, C.B.E., late General Superintendent, North Eastern Area, London and North Eastern Railway.

Lectures for Graduates and Students:—

January 15, 1924.—" Railway Signalling and its Development." Mr. A. F. Bound, Signal Engineer, Great Central Section, London and North Eastern Railway.

February 19, 1924.—" Salient Points in Transport Accountancy." Road: Mr. R. C. Reynolds, O.B.E.; Railway: Mr. C. L. Edwards, C.B.E., Chief Accountant, London and North Eastern Railway.

March 18, 1924.—" Relative Efficiency of Horse and Mechanical Power for Road Transport." Mr. E. Falconer.

April 15, 1924.—" The Rating of Railways and Docks." Mr. A. J. Brickwell.

May 20, 1924.—" The Scientific Preparation of Railway Time-tables." Mr. F. Bullough.

Merthyr Tydfil and its Railways.

Prior to the great changes wrought by the Railways Act, Merthyr Tydfil as a railway centre was very cosmopolitan in character, the engines and trains of five different companies—Great Western, London and North Western, Taff Vale, Rhymney and Brecon and Merthyr—using its only passenger station; and now—if one may for a moment ignore the Great Amalgamation—a sixth railway is to be added, in that a Barry 2-4-2 engine (now G.W.R. 1316) recently arrived there with a Taff Vale train from Cardiff. Opened in October, 1853, by the then Vale of Neath Railway, High Street station was designed by Brunel, and is of the covered-in type, with peaked roof supported by rows of wooden columns along the platforms. The Vale of Neath Company was absorbed by the Great Western Railway in February, 1865, but the station is much the same to-day as when opened 70 years ago, although a rearrangement of platforms has increased the accommodation; there now being five platform faces.

In 1868 Brecon and Merthyr trains commenced to use the station, being the first " foreign " trains to do so. The B. and M. line from Brecon came in from the north and described almost a half-circle before it gained access to the station from the south via Rhydycar Junction. (High Street terminus lies due north and south.) Next came the Taff Vale Railway, who abandoned their own station (the first one at Merthyr, dating from 1841) for passenger purposes in 1878, and gained the High Street station by means of a new short piece of joint (T.V. and G.W.) line from Brandy Bridge Junction to Mardy Junction. The London and North Western followed in 1879, coming in via Rhydycar Junction over the B. and M.R., a portion of which line (from Morlais Junction to Rhydycar Junction) was made joint B. and M. and L. and N.W. property from the same date. In 1886 the Rhymney Railway obtained an entry into Merthyr, reaching the station via the Rhymney and G.W. joint line from

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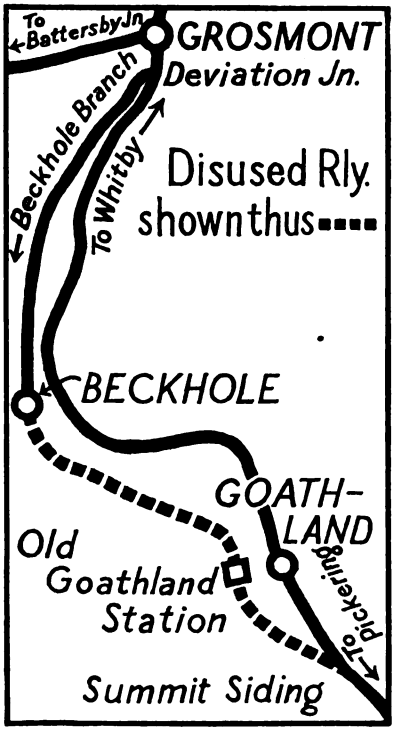
Quakers' Yard. Finally, as recorded above, and due to the pooling of locomotive power since grouping became effective, ex-Barry Railway engines also work into the station.

Whitby and Pickering Railway and the Beckhole Branch.

WE are indebted to officers of the London and North Eastern Railway for the following information in reply to a question raised by a Sutton reader in regard to the Beckhole branch. "The original Pickering and Whitby branch ran via the present Summit Siding and Beckhole to Grosmont, and was laid down about 1835. Until 1846 the trains were worked by horse-power from Pickering to the old rope incline, and from Grosmont to Whitby respectively. Steam locomotives were introduced on the line in 1846. In 1865 a new line was laid from a point now known as Deviation Junction to the Summit, and shortly after the completion of this the old line was cut at Beckhole, the portion from Summit to Beckhole being taken out, and that from Beckhole to the Deviation Junction being left. This formed the existing Beckhole branch, which was used for goods traffic only until about 1908, when a passenger (autocar) service was introduced between Grosmont and Beckhole. This service had necessarily to be discontinued during the war period, and before its restoration was due to come under review. One of the bridges on the Beckhole branch had, unfortunately, to be pronounced unsafe by the engineer owing to the failure of the timber piles carrying the railway over the river—this was in 1920. At the present time Beckhole, a charming little spot much frequented by picnic parties, is served by all the Pickering-Whitby branch trains from Goathland station."



SKETCH PLAN SHOWING RAILWAYS AT BECKHOLE AND GOATHLAND.

Economics of Railway Main Line Electrification.

MR. ROGER T. SMITH'S Presidential Address on Railway Electric Traction, delivered on October 10 before the Société des Ingénieurs Civils de France (British Section), was an interesting survey of the question. The main object of the address was to bring out the conditions under which main line electrification would pay in Great Britain. By a comparison of the total working costs of steam and electric haulage on a hypothetical system of 100 miles of double track with a traffic density equal to the average for Great Britain, he concludes that the costs of working with steam or electricity are to-day about the same, on the assumption that the cost ot transmission does not exceed £500,000. But this expressly does not take into account the improvements in traffic working due to electrification nor the economic advantages of pooling engines. There are, in addition, other economies besides the cost of power which electric traction is capable of producing in railway working, consequent upon the reduction of the number of locomotives required by 50 per cent. A most interesting review was given in the address of the progress of railway electrification in France, Italy and Switzerland, and the reasons which have led to the adoption of the different systems of traction. In spite of a much lower traffic density in Italy and Switzerland than with us, electrification is a paying proposition in those countries because of the cost of imported coal.

Austrian State Railways.

ONE of the chief causes of the chaotic state of Austrian national finance is the deficit on the Austrian State Railways. At the request of Dr. Zimmerman, the Commissioner-General of the League of Nations for Austria, Sir William Acworth, the British railway expert, and Dr. Herold, director of the Railways Section of the Swiss Federal Department of Railways, Ports and Telegraphs, have made a stay of several months in Austria and made a report to Dr. Zimmerman.

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While the report advocates that the State should, if possible, retain possession of its railways, it is pointed out that this will only be possible if they are really managed as a business undertaking in the interests of the whole community. If political influence or local or sectional interests are allowed to prevail, the surrender of the railways into private hands may ultimately be found the lesser of two evils.

Then it is shown that at present:

(1) The railways produce large earnings with which they are not credited.

(2) Perform important and expensive services for which they are not paid.

(3) Have imposed upon them heavy burdens for purposes not properly railway purposes.

(4) Railways are not at present debited with all the charges which properly they ought to bear.

State Taxes and Unpaid Services.

WHEN the Austrian public pay 130 kronen to the railways the Finance Minister takes 30 kronen as a tax. This tax represents half the railway deficit. Hardly any railway in the world could bear such a burden and live. Unpaid services rendered by Austrian railways to the Post Office is no less than 80 milliards kronen per annum. Burdens imposed upon the railways for State reasons include:

(1) The obligation to take over and assure the deficit on certain local railways.

(2) Pensions granted by the State on conditions so extraordinarily generous that they often exceed the salary at date of the retirement.

(3) Obligation to purchase supplies in the country which of necessity means enhancement of price.

On the other hand railways should be debited with a reasonable sum for depreciation, reserve, and also with the interest on the debt incurred by them, or by the State on their account.

Making all allowances, there will be a loss on the Austrian railways for 1923 of a sum approaching 400 milliards. Sir William Acworth, and his assistant, Dr. Robert Herold, consider this loss can be and should be converted into a profit. Hope for the future is centred in the fact that new relations have been entered into with the railways on the one side and the State and the Finance Ministry on the other. Parliament and the Ministry have come under an obligation to refrain from interference in administrative matters and to restrict their control to questions of broad policy and weighty matters of finance.

Need for Re-organisation.

A GREAT weakness is the existing organisation of the Austrian railways. There is no responsible head. Responsibility is imposed upon so many persons that in effect it fails to fall definitely upon any one. At present the railways are over-staffed and many clerks and others are employed on unproductive and unnecessary duties. Dr. Herold points out the rigid interpretation in Austria of the eight hours day as meaning continuous employment, whereas in the Swiss systems a man is employed when needed and relieved from attendance when there is no work to do. Under the Austrian system cases occur where more than half the time paid for is in fact spent in idleness on the station premises.

It is stated that the railways are overstaffed to the extent of 23,600 men, and that only in regard to locomotive running is the number of employed kept within reasonable limits.

Lower than Pre-war Fares.

WHEN reduced to a gold parity, present passenger fares are on the average less than two-thirds of the pre-war fares, but goods rates average 10 per cent. above pre-war figures. It is suggested that tariffs averaging as a whole 15 per cent. above the pre-war tariffs would be fair both to the railways and to their customers. It is further said that this average increase of 15 per cent. should be in the form of 25 per cent. in passenger fares, which would produce an additional 180 milliards, and an average increase of 10 per cent. in freight rates, which would bring in 235 milliards. The total new net revenue to the railways would then be 415 milliards.

Even after this increase passenger fares would still be only on the average about three-fourths of the pre-war fares, and it is pointed out that the long-distance fares are now on so low a scale that a first-class passenger pays to-day practically what it would have cost him to travel third-class in 1913. In regard to freight traffic, it is felt to be fairer that the railway customer should pay for the service rendered to him than that the taxpayer should be called upon to meet the deficiency.

In conclusion, a point of utmost importance is dealt with. Tariffs are a matter of infinite complexity. Adjustments are matters for experts, whose only interest it is to raise the needful revenue in the manner which is least burdensome to the railway customers. It is urgently necessary the experts should be supported in resisting the pressure of local or sectional interests to procure favourable treatment at the cost of the community as a whole.

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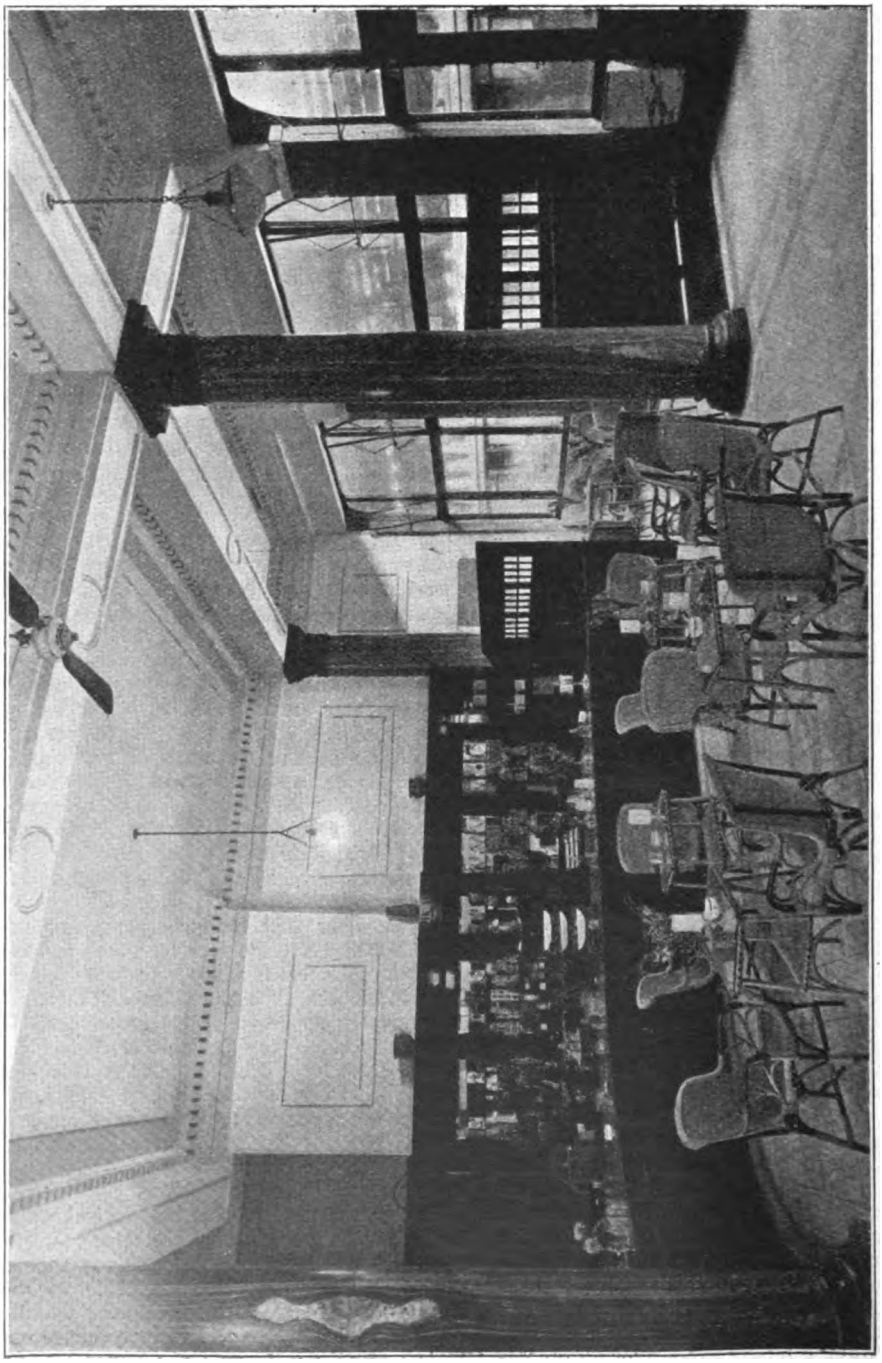

NEW REFRESHMENT ROOM AT PADDINGTON STATION, GREAT WESTERN RAILWAY.

Previously used as a Tea Room, this new Refreshment Room is situated between the Royal Waiting Room and the entrance to the General Manager's Office.

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Education and Staff Training on the London Midland and Scottish Railway.

AN important branch of the work now concentrated under the London Midland & Scottish Railway Company's Welfare Scheme is the education and training of staff, and the arrangements for the Session 1923-24 are of a very comprehensive character.

Instruction is provided, on a large variety of subjects, for staff of all grades and of any age. The educational scheme, as set out in the General Manager's circulars, includes :—

1. Classes for juniors who are preparing for their efficiency examination.
2. Classes for clerical staff of any age who desire to improve and increase their knowledge of goods and passenger station clerical work.
3. Provision of commercial and technical courses of instruction, by arrangement with local education and university authorities.
4. Lectures and discussions on a variety of subjects of special interest to railwaymen ; these are open to all staff, irrespective of age or grade.

The centres selected number 65, and cover practically the whole of the system. The times and dates have been so arranged as to enable the staff at or near the various points to take full advantage of the facilities offered. Instruction is given two weeks in succession, usually between the hours of 6 p.m. and 8 p.m., so that staff working early and late turns of duty may attend for a complete course.

The subjects dealt with touch upon all of the many branches of railway activity, and include :—

1. Goods and passenger station working, &c. This course, in a series of 40 lessons spread over two sessions, covers every branch of railway station clerical work, and makes provision for study of the London Midland & Scottish and other railways, with principal junctions, connections, steamship routes, &c., also for commercial English, *précis* writing, &c.
2. Railway operation ; the function of railway operating ; organisation and administration, &c.
3. Modern road transport ; the relation of road to rail transport, &c.
4. The construction and maintenance of carriages and wagons.
5. Traction—steam and electric.
6. Construction and maintenance of signals and signalling equipment.
7. Working organisation.
8. Workshop costing systems.
9. The Permanent way.
10. Statistics (locomotive running, coaching and freight train traffic). The necessity for compilation and use of statistics.

The classes and lectures are free to the whole of the staff, no charge whatever being made. Further, travelling facilities, within a reasonable radius, are given to those desirous of attending.

The movement has been considerably strengthened by the co-operation of a number of local education authorities, and with their assistance courses of instruction on subjects specially suited to the needs of the railway staff in the district concerned have been instituted at Barrow-in-Furness, Crewe, Derby, Earlestown, Glasgow, Holyhead, Horwich, Huddersfield, Manchester, Perth and Wolverton. In addition the company, in conjunction with the London County Council, have again formed classes at Euston for instruction on Railway Economics, Railway Law, Commercial Law, Railway Accounts, Railway Rates and Charges, Railway Administration, Electrical Engineering, Economic Geography, Shorthand, English, French and German. Arrangements have also been made with the London School of Economics and the University of Manchester for the attendance of clerical staff at lectures on a large number of subjects having relation to transport.

Classes are again held at the company's School of Signalling at Victoria station, Manchester ; block signalling classes have also been established at 20 other courses. With the development of the educational work generally the company's entrance examinations for applicants and efficiency tests (at age 18) for clerical staff in the service have been co-ordinated and standardised for the entire system.

A Traffic Half-Century.

IT is pleasant to congratulate another railway engineer on attaining the blue riband of the engineering profession—the presidency of the Institution of Civil Engineers. Sir Charles Langbridge Morgan, the former Engineer of the Brighton line, in his presidential address dwelt largely upon the traffic developments which had taken place, particularly in the Metropolitan area, within his personal professional experience, which had extended over 50 years from his pupilage in 1870 to 1920. He drew an interesting picture of London traffic conditions in the former year, when the travelling facilities comprised the original sections of the Metropolitan and District railways, then popularly called " the Drain," the penny steamboats (since deceased), the hansom, the " growler " and the horse-drawn omnibus, upon which, if you were athletic enough, it was a privilege to get a box-seat next the driver, and not only learn your London but some of its choicest vocabulary. The first tramway was not opened until 1871. Sir Charles then recorded the immense advances in traffic facilities and other developments during the past half-century, and despite the present engineering and industrial depression, looked forward with confidence to even greater developments in the future. Whilst predicting considerable further extension of electric traction, having regard to the high efficiency of the steam locomotive and its elasticity under load, he viewed with very considerable doubt the desirability as a commercial proposition of the application of electricity to main line traffic.

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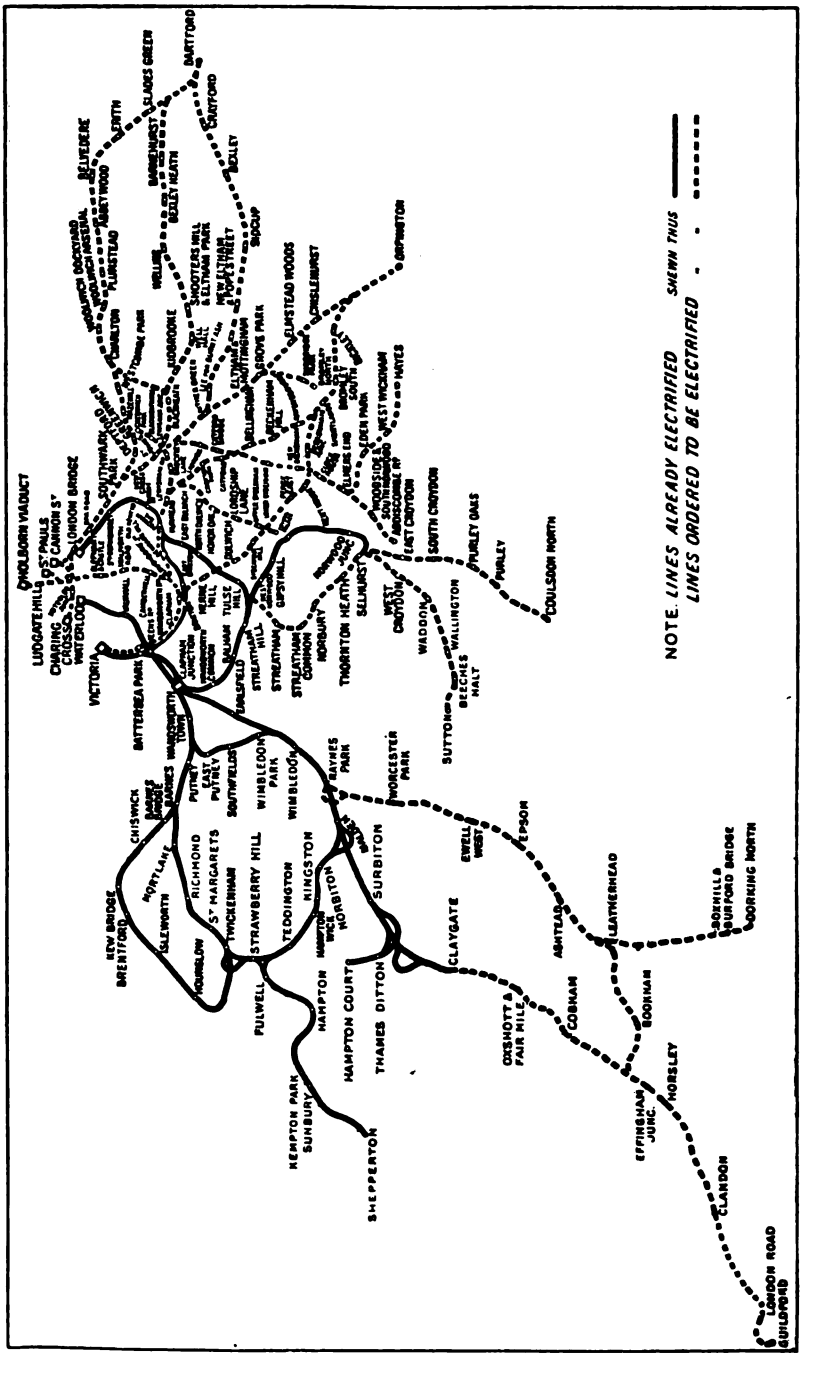

MAP SHOWING LINES ALREADY ELECTRIFIED AND TO BE ELECTRIFIED, SOUTHERN RAILWAY.

A large programme of new works has been announced by the Directors of the Southern Railway Company, including notable extensions of electrification as shown by the map above reproduced, many improvements to stations and other premises, docks, &c., and new steamers.

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MODEL OF MAIL EXCHANGING APPARATUS.
Bassett-Lowke Ltd.

Railway Model Making.

ENGINEERING models of all descriptions have their uses and their devotees, but railway and locomotive models unquestionably hold the premier position in the regard of the mechanically-minded. We have been privileged to inspect the proofs of the new catalogue prepared by Messrs. Bassett-Lowke Ltd., Northampton and London, for the Christmas trade of the current year, and we notice how up-to-date the firm continues in all its activities to meet the wants and gratify the wishes of model owners generally and of railway and locomotive model users in particular.

There is probably no model railway accessory more in request than a turntable. Yet this is one of the most difficult articles to design and make satisfactorily so that it will turn locomotives from the smallest to the largest expresses, and at the same time keep the price within reasonable limits. The firm in question have a model in the similitude of the Great Western Railway balance turntable, and this is a great advantage in model work, as no pit or well is required.

A model of special note is that of a new London Midland and Scottish Post Office mail van with pick-up apparatus. An illustration appears on this page. While another that is particularly popular is a standard 4-4-0 express locomotive in O gauge.

For builders of model railways the firm supply very attractive railway signs. These show the title of the railway and the names of the directors, managers, &c., and are calculated to give an air of reality to the most modest of model lines.

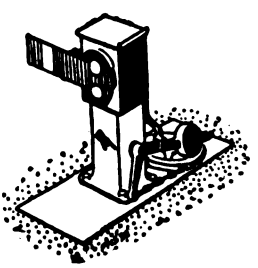
Tunnel mouths form another speciality of this enterprising firm. To the traveller on Britain's great trunk lines the architectural glories, or otherwise, of a tunnel mouth may be a matter of profound indifference. Not so the model owner, to whom this feature of his railway is of prime importance so far as appearances go.

In signals, too, the model railway builder desires both accuracy and consistency, and Messrs. Bassett-Lowke Ltd. claim that their signals have some pretension to scale size, and in addition are made in metal throughout, hand-enamelled and stoved, and have transparent coloured spectacles.

In railway model sundries there is a wide variety, but particularly attractive are the railway posters in miniature. The firm have produced a fine series, the different railways concerned having given courteous assistance in ensuring the excellence of this part of the firm's output.

Section "A" of the catalogue—the Railway Section—includes particulars of all the new lines for the 1923-24 winter season, as well as of standard articles, and the price is 1s. post free, but an abridged catalogue is sent post free on receipt of a postcard request, and the sender's name and address. The abridged catalogue is not confined to railways and locomotives, although these take precedence; a number of pages are devoted to model motor boats, yachts, torpedo boats, &c.

Messrs. Bassett-Lowke Ltd. possess a great reputation, and judged by the foregoing RAILWAY MAGAZINE readers will readily realise the firm means to maintain it.



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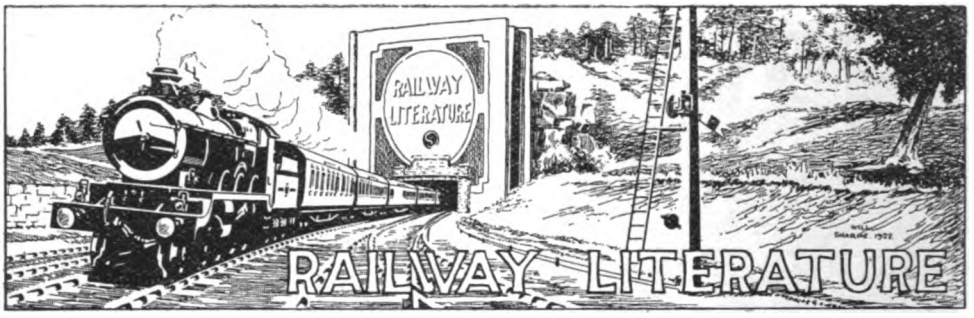

UNIVERSAL DIRECTORY OF RAILWAY OFFICIALS, 1923. [London: The Directory Publishing Co. Ltd., 33, Tothill Street, Westminster, S.W.1. Cloth, 8¾ in. by 5¾ in. 400 pp. Price 20s. net.]

This is the twenty-ninth year of the publication of this valuable directory. The grouping of the British railways has necessitated the re-casting of a considerable portion of the book, and opportunity has been taken to make this the occasion for the introduction of a new style of type and to establish a general and particularly effective rearrangement of the subject matter.

In previous editions the British Isles were divided into three sections, viz., England and Wales, Scotland and Ireland. As there are now no independent Scottish companies, other than the Campbeltown and Machrihanish Light Railway and the Glasgow Subway, the general heading, Great Britain, has been adopted for the railways of England, Wales and Scotland, with a separate section for Ireland. In regard to foreign railways, the directory provides each title in English and in the language of the particular country in which the line is located. Users who take care to adopt the foreign title will be saved the annoyance of the non-delivery of their letters through errors or misunderstandings. The length of each railway is given in English miles or kilometres, while the rail gauge is quoted in feet and inches or in metres. The numbers of locomotives, carriages and wagons owned by each company is another feature worthy of notice. In addition to the directory, which comprehends the railways of every country in the world, there is included a personal index of railway officials of all nations, and an index to the names of railways, railway institutions and associations.

While every credit is due to the compilers for the success attending their labours in acquiring full and accurate details of railways overseas, particularly the new European States such as Jugo-Slavia, Poland, &c., to say nothing of distracted and dismembered Russia, we feel that special congratulation should be tendered to them for the very complete and comprehensive handling of the reorganised British railways. By reason of the operation of the Railways Act, 1921, which came into force on January 1, 1923, the official arrangements of the principal railways of England, Scotland and Wales were plunged figuratively into the melting pot, and the officers in charge of the various departments and lines have been changed from one position to another during the past months of 1923 in a manner unprecedented in the history of the industry. All the same, it will be found that the directory has kept pace with these kaleidoscopical changes, and as evidence of how down-to-date it is, mention may be made of the fact that it contains the names and addresses of numerous railway officers who entered upon their present appointments as recently as October 1. In brief, this handy book, well bound, excellently printed on good paper and in clear and readable type, is an indispensable reference work for all who have business with railways at home or abroad. By its aid the manufacturer of material or other interested person, in a few seconds, can have under his eye concrete particulars of the railway in which at the moment he is concerned, together with the name and location of the right officer with whom he should communicate.

A CENTURY OF LOCOMOTIVE BUILDING BY ROBERT STEPHENSON AND COMPANY, 1823-1923. By J. G. H. Warren. [Published by Andrew Reid and Company Limited, Akenside Hill, Newcastle-on-Tyne. Price, 28s. net.]

While primarily written in view of the centenary of this well-known firm, the author has actually complied a valuable collection of historical information in regard to the development of the locomotive engine. In itself, the volume is one which should appear in every locomotive engineering library, and is well worthy of a place on the shelves of everyone interested therein. Its 461 large pages are liberally illustrated with photographic reproductions, line drawings, and

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facsimiles of letters and documents written by George and Robert Stephenson and other personalities of their day who are referred to. A number of interesting portraits are also included. Besides concerning himself mainly with locomotive development in the hands of George and Robert Stephenson, and with the work of this historic firm during the past 100 years, the author has attempted to settle various points of controversy, and in this connection extended research has brought to light many hitherto little known or unknown items of information. By way of preface, the author contributes personal references, one on George Stephenson and the other considering " The Two Stephensons " together.

Chapter I deals with " The First Railroads," and Chapter II with the first locomotives, in which reference is made to the work of Trevithick, Blenkinsop, Hedley and others. In Chapter III George Stephenson's original engines receive attention, while Chapter IV is devoted to the Stockton and Darlington Railway. Subsequent chapters deal with Edward Pease, and the foundation and development of the firm of Robert Stephenson and Company, including reference to Michael Longridge, who, with George and Robert Stephenson and Edward Pease, formed the firm as originally constituted. This latter section is one of peculiar interest, in that many facts, as to which there has been considerable uncertainty, are established. The first locomotives of the Stockton and Darlington Railway are then described, while in Chapter VIII the first locomotives supplied to France (1828-9) are considered. Following chapters relate to the " Lancashire Witch " (1828); the first locomotives for America (1828-9); the Liverpool and Manchester Railway; the " Rocket "; the Rainhill trials; the firebox of the " Rocket "; the blast pipe; the Canterbury and Whitstable Railway; the " Rocket " type; the " Northumbrian "; the opening of the Liverpool and Manchester Railway; the " Planet "; the " Planet " type and some more experiments; Hackworth's and Stephenson's locomotives on the Stockton and Darlington Railway, 1830-40; the Stephenson locomotive in America; the six-wheeled locomotive and Robert Stephenson's patent, 1833-41; Brunel and the broad gauge; Robert Stephenson's " Long Boiler " locomotive; the evolution of the Stephenson link motion; and the gauge experiments and the Stephenson locomotive, 1845-60. All these chapters are liberally provided with footnote references to authorities, while the text includes numerous quotations and extracts both from early historical works and from correspondence and other documents, besides facsimile reproductions of sketches, letters, &c., in addition to drawings of the period. The remainder of the book is concerned with later developments in the history of the firm, many interesting examples of work done being illustrated, including special developments during the period of the Great War, while the final chapter describes the modern steam locomotive, with particular reference to the part played by George and Robert Stephenson and by the firm in its development.

THE RAILWAYS OF GREAT BRITAIN. By G. Gibbard Jackson. [The Religious Tract Society, 4, Bouverie Street, London, E.C. 4. Price, 5*s.* net.]

In general, Mr. Jackson has adopted the system followed by Mr. W. J. Gordon in " Our Home Railways," published some ten years ago, and to which reference is made, in that chapters are allocated to the leading pre-grouping railways, or two or three are considered together, while various aspects of railway and locomotive operation are dealt with incidentally here and there. But even after allowing for the fact that he has written for a juvenile public, to which most of the more or less hackneyed episodes and anecdotes which figure in nearly all railway historical works will be new, he has actually done little more than string together a collection of stories and incidents, true and apochryphal, together with remarks concerning the various railways, but including very meagre information beyond that of a general and ordinary character. Moreover, his explanations of methods, practices and operations are frequently too superficial to convey very much in the way of tangible knowledge. Allowing, too, for occasional slips and those inaccuracies which are almost certain to arise here and there in a work of any magnitude, there are rather too many remarks to which exception can be taken, while we must confess to a feeling of irritation due to the frequent employment of the personal pronoun, of " you " and " your," the author's fondness for the word " wee " in many connections, and the use of slipshod or colloquial terms such as " tankie " or " tanker " when referring to tank engines, " four-coupler " for " four-coupled," " namers " for named locomotives, and so on.

There is a good series of illustrations, and they are well reproduced, though many of them are of a stock and familiar character. In a number of cases, however, they are inaccurately described, or are now out of date. For example, the coloured frontispiece is described as a " G.E.R. Hunstanton Dining Car Express on Brentwood Bank," though Hunstanton trains do not travel that way. Actually, we believe the " Norfolk Coast Express " is shown in days when

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blue 4-4-0 locomotives were used for it. A train leaving Paddington, hauled by *The Great Bear*, is described as the "Cornish Riviera Express," though this engine has never been used for that famous train. Similarly, a London and South Western "Boat Train from Southampton to Waterloo" includes a Pullman car (!), and the two relatively old 4-4-0 engines carry a head-code which has not been used for a number of years. The enclosing wrapper and the front cover of the volume itself bear a crude coloured view of a Great Northern train.

LIGHT LOCOMOTIVES. Andrew Barclay and Sons Limited, Caledonia Works, Kilmarnock.

A descriptive catalogue dealing with locomotives of light designs, more particularly for use on narrow-gauge construction lines, and with special reference to the supply of spare parts.

COKE AND ITS USES: IN RELATION TO SMOKE PREVENTION AND FUEL ECONOMY. By E. W. L. Nicol. [Ernest Benn Limited (Benn Brothers), 8, Bouverie Street, London, E.C.4. Price 19s. 6d. net.]

This volume, the author of which has special qualifications as an authority on the subject involved, deals particularly with various applications of the use of coke instead of, or in preference to, coal. Earlier chapters deal with various aspects of carbonisation, except that the use of coke as fuel for gas producers is not included. Other applications are, however, very fully covered, including blends of coal and coke and pulverised fuel for steam-raising. The employment of coke as fuel for steam-raising generally for use in electric power stations and other applications, as well as special appliances for use therewith, are very fully covered in the course of 134 pages, with the aid of 11 plates and 22 diagrams, drawings, and other illustrations in the text. The volume is well produced, and to those interested in steam-raising and fuel questions generally will, no doubt, prove of great reference value.

BURNS'S INCOME TAX GUIDE. Fifth Edition. By John Burns, W.S. [Published by W. Green & Son Ltd., 2, St. Giles Street, Edinburgh. Price 2s. 6d. net.] This booklet, covering the 1923 Budget, continues the series of editions previously published under the title of Chambers's Income Tax Guide.

THE
RAILWAY MAGAZINE,
JANUARY, 1924.

Forthcoming January issue of this periodical will begin a new volume. In accordance with the custom of many previous years the first number for the New Year will be largely of a Scottish character.

Frontispiece to the January magazine will be a reproduction of an oil-painting by F. MOORE, depicting a

4-Cylinder 4-6-0 Locomotive, London Midland & Scottish Railway (Western Division).

Painted, numbered and lettered in the new style.

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MR. ARTHUR WATSON, General Manager of the London Midland & Scottish Railway, at a meeting of the General Managers' Conference, held at the Railway Clearing House, was unanimously elected Chairman for the year 1924.

* * *

AT a recent meeting of the Irish Railway Managers' Conference, Mr. M. F. Keogh, General Manager, Midland Great Western Railway, was unanimously elected Chairman of the Conference for the year 1924. Mr. Keogh in his early career had experience as a parliamentary agent at Westminster. In 1898 he returned to Ireland as Secretary of what is now known as the Dublin & South Eastern Railway. In January, 1913, he succeeded Mr. Tatlow as General Manager of the Midland Great Western Railway..

* * *

MR. G. B. HAYNE, who, as announced last month, has been appointed an Assistant to the General Manager of the Southern Railway for Parliamentary and General Purposes, entered the General Manager's office of the South Eastern Railway as an apprentice in 1890, and in 1899, when Mr. Alfred Willis succeeded to the General Managership, he was appointed Private Secretary to that gentleman, and assisted his chief in the long proceedings attendant upon the passing through Parliament of the Bill for the Working Union of the South Eastern and London, Chatham and Dover Railways. Mr. Hayne afterwards became Confidential and Parliamentary Assistant to the late Mr. Vincent Hill (in addition to being the first Secretary of the company's side of the Conciliation Boards on the South Eastern and Chatham Railway), and on the latter's retirement in 1911 was appointed "Assistant to the General Manager," serving under Sir Francis Dent and recently under Sir Percy Tempest.

MR. A. H. BULL,

Audit Accountant, Southern Railway.

* * *

MR. W. G. PAPE, who has been made Indoor Assistant to the General Manager, Southern Railway, joined the service of the London, Brighton and South Coast Railway as a Junior Clerk in the General Manager's office in 1900. After occupying various positions he became Assistant Staff Clerk. Trained under Mr. Finlay Scott, the Superintendent of the Line, he obtained practical experience in signalling, station working and general outdoor working in the operating department. In 1909 Mr. Pape became Assistant Private Secretary, and afterwards, in 1910, Private Secretary to Sir William Forbes, then General Manager. From July, 1916, while retaining existing duties he also acted as Chief Clerk in the General Manager's office, being definitely appointed to that position in January, 1918, and promoted to the rank of Chief Assistant to the General Manager in January, 1921.

* * *

MR. W. MAJOR, recently appointed Indoor Staff Assistant to the General Manager, Southern Railway, joined the service of the

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MR. G. B. HAYNE,
Assistant to the General Manager, Southern Railway, for Parliamentary and General Purposes.

MR. W. G. PAPE,
Indoor Assistant to the General Manager, Southern Railway.

MR. W. MAJOR,
Indoor Staff Assistant to the General Manager, Southern Railway.

MR. A. HARRIS,
Outdoor Staff Assistant to the General Manager, Southern Railway.

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South Eastern Railway at Bricklayers' Arms station and was transferred in 1885 to the Goods Manager's office, being ultimately appointed Chief Staff Clerk in 1908. In 1911 Mr. Major transferred from the Goods Manager's department to the General Manager's, where he took control of the staff work, being appointed Secretary of all Conciliation Boards. In 1919 he became Assistant to the General Manager for Staff and Labour matters.

* * *

MR. A. HARRIS, who is now Outdoor Staff Assistant to the General Manager, Southern Railway, joined the South Western in 1881 as Junior Clerk at Bridestowe. In 1887 he went on to the Relief Staff, performing duty both for clerks and station masters. In 1899 he became Chief Staff Clerk to the Superintendent of the Line, and in 1912 Chief Staff Clerk to the General Manager (South Western section).

* * *

MR. F. V. MILTON, who has been appointed Chief of Publicity Section, General Manager's Department, Southern Railway, entered the Traffic Department of the London and South Western Railway in 1888 and served at Clapham Junction and other London stations. In 1893 he went to the Superintendent's office, assisting to deal with damage to stock, through working of saloons, &c. In 1894 he passed to the Goods Manager's office (canvassing and general), and thence to the personal staff of the Goods Manager (Sir Chas. Owens). In 1898, when Sir Chas. Owens became General Manager, Mr. Milton was transferred to his office. In 1913 Sir Herbert Walker created a Publicity Department, and Mr. Milton was placed in charge. The business done included general developments, ticket agencies, sites for factories, and a Continental section was added in 1914.

MR. F. V. MILTON,

Chief of Publicity Section,
General Manager's Department,
Southern Railway.

MR. G. H. DENNIS,

Chief of Advertising Section,
General Manager's Department,
Southern Railway.

MR. GEO. H. DENNIS, who has been appointed Chief of Advertising Section, General Manager's Department, Southern Railway, commenced his railway career with the London, Brighton and South Coast Railway in 1883. After six years of station experience he entered the office of the Traffic Superintendent. Gaining experience in various departments at London Bridge, including several years in the time-table and special traffic sections, he was transferred in 1899 to the advertising department, and later given control of the department under Sir William Forbes. Mr. Dennis has for many years past been the adviser of the different official publicity associations in the territory served by the Brighton Railway.

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In addition to the foregoing appointments, the Southern Railway directors have made the following appointments :—

Audit Accountant's Department.

Audit Accountant, Mr. A. H. Bull, Audit Accountant, S.E. and C.R.

Assistant Audit Accountants, Mr. A. E. Moore, Audit Assistant, L. and S.W.R., and Mr. J. S. Wilson.

Chief Mechanical Engineer's Department.

Assistant to Chief Mechanical Engineer and Works Manager at Ashford, Mr. G. H. Pearson, Works Manager, Ashford, S.E. and C.R.

Assistant Works Manager at Ashford, Mr. C. J. Hicks, Assistant to Works Manager, Ashford, S.E. and C.R.

Personal Assistant to Chief Mechanical Engineer, Mr. J. Clayton, Personal Assistant to Chief Mechanical Engineer, S.E. and C.R.

Manager, Carriage and Wagon Works, Lancing, Mr. G. Gardener, Assistant Carriage and Wagon Superintendent, L.B. and S.C.R.

Chief Operating Superintendent's Department.

Assistant Operating Superintendent for Train Services, Mr. H. E. O. Wheeler, Assistant Superintendent of the Line, S.E. and C.R.

General Assistants to Chief Operating Superintendent, Mr. W. J. England and Mr. F. Browning.

Assistant to Chief Operating Superintendent for Rules and Regulations, Mr. S. Barter.

Chief Clerk, Mr. L. W. Judd, Chief Clerk to the Superintendent of the Line, L. and S.W.R.

Also the following Divisional Operating Superintendents (with headquarters as stated) :—

London (East) Division, London Bridge.

Mr. E. J. Missenden, District Superintendent, London (Traffic), S.E. and C.R. ; Assistant, Mr. A. White, Assistant to Superintendent of the Line, L.B. and S.C.R.

London (West) Division, Waterloo.

Mr. A. H. Hoyle, Western District Superintendent, Exeter, L. and S.W.R. ; Assistant, Mr. R. M. T. Richards.

Eastern Division, Dover.

Mr. F. A. Ellender, Western District Superintendent, Redhill, S.E. and C.R. ; Assistant, Mr. E. A. Richards.

Southern Division, Brighton.

Mr. C. J. C. Latham, Eastern District Superintendent, Ashford, S.E. and C.R. ; Assistant, Mr. W. E. Reynolds, Chief Clerk to Superintendent of the Line, L.B. and S.C.R.

Central Division, Southampton.

Mr. E. Hight, Northern District Superintendent, Chatham, S.E. and C.R. ; Assistant, Mr. E. Myles.

Western Division, Exeter.

Mr. D. S. McBright ; Assistant, Mr. J. C. Dann.

* * *

Mr. H. A. Watson, who has been General Superintendent of what is now the North Eastern Area of the London and North Eastern Railway since 1902, has expressed a wish to retire at the end of the year. The directors have accepted Mr. Watson's resignation with regret, and have expressed their appreciation of his valuable services. They have appointed Mr. C. M. Jenkin Jones to the position of Superintendent, North Eastern Area, as from January 1, 1924.

* * *

Mr. A. G. Stevenson, Estate Agent, North Eastern Area, has also decided to retire at the end of the year. The directors have arranged to relieve him of his present duties forthwith, in order that he may undertake a special enquiry for them in regard to welfare work on the London and North Eastern system. Mr. J. Oldham has been appointed Estate and Rating Agent, North Eastern Area, as from October 1, and Mr. A. J. Brickwell becomes Estate and Rating Agent, Southern Area, as from the same date.

The directors have also made the following appointments :—

Mr. Paul Gibb, Divisional Accountant, North Eastern Area, to be Assistant to the Divisional General Manager, Southern Area.

Mr. H. Laird, Accountant and Cashier, Great North of Scotland Section, to be Divisional Accountant, North Eastern Area.

Mr. C. B. Tidmarsh, Assistant, Surveyor's office, King's Cross, to be District Estate and Rating Agent at Manchester.

* * *

Mr. A. B. Coulter, who has become District Goods and Passenger Manager, Cambridge, London & North Eastern Railway (Great Eastern Section), entered Great Eastern service at Hertford, subsequently serving at Bishop's Stortford, Ely, Histon, and in the District Goods Manager's office at Cambridge. Then transferred to Ipswich, he remained there five years. He went to the Goods Manager's outdoor staff at Liverpool Street for 12 years, during which he was principally engaged in canvassing. In 1911, Mr. Coulter became Agent for the Great Eastern Railway in Liverpool, Birkenhead and Garston, and in 1913, a portion of the

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Manchester district was placed under his supervision. In July, 1921, he returned to London, and was placed in charge of mineral, merchandise and passenger traffic canvassing for the Great Eastern system.

* * *

MR. T. C. HUMPHREY, Stationmaster, York, has been appointed to succeed Mr. W. Thompson as stationmaster at Newcastle. Newcastle Central is the "blue riband" station of the North Eastern Area, and on the basis of "number of trains in 24 hours," Liverpool Street and Waterloo beating its record in this respect by only slight margins, the third busiest station in the country. Mr. Humphrey entered North Eastern Railway service as a Clerk at Shincliffe, Durham, in 1882. In the same year he went to Low Row, from which place he was transferred a year later to the District Superintendent's office. He was made Relief Clerk in 1891, and Stock Inspector in 1898. Between 1900 and 1902 Mr. Humphrey served as Chief Assistant Stationmaster at York. He returned to Newcastle in 1902 as first Yardmaster at Forth, Newcastle, with control also of the Elswick and Blaydon goods yards.

* * *

A FUNCTION that will live long and pleasantly in the memories of those privileged to be present was the annual dinner of the London and North Eastern Railway Musical Society recently held in the Hamilton Hall of the Liverpool Street Hotel, London, E.C. In the chair was Colonel William Johnson Galloway, a London and North Eastern Railway director, upon whose initiative the Great Eastern Railway Musical Society, from which the present society has been evolved, was established 15 years ago. Mr. S. A. Parnwell, Divisional General Manager, Southern Area, occupied the vice-chair. Very great credit is due to Mr. A. W. Headley, hon. secretary, and to the dinner committee, for the general excellence of the arrangements. The committee consisted of Messrs. P. Syder (chairman), G. Keary, J. E. Sharpe, A. O. Shave, G. G. Smithies, F. H. H. Thomas and E. F. Warren. The after-dinner speakers, in addition to the chairman who had a tremendous reception, were Sir Hugh Bell, Bart., C.B., Mr. S. A. Parnwell and Mr. H. T. Bailey. At the conclusion of a speech of rare and striking eloquence, Colonel Galloway, who is the society's hon. conductor, stated that Mr. W. Whitelaw, Chairman of the London and North Eastern Railway Company, and President of the Society, had authorised him to state that the board of directors was deeply interested in everything affecting the welfare of the staff. They had ordered a report to be presented to them of the various societies and other forms of recreation in which the staff is interested, and when they had had an opportunity of considering the information thus obtained, the board hoped to be able to come to a decision as to how they could best assist this very desirable object. He had also been asked to state that the chairman hoped that the staff generally would appreciate that the one and only desire of the board in such matters was to help where they could, but not in any way to interfere or control. This was the policy which had been followed by the boards of directors of each of the companies forming part of the new system, and the new board of directors was not less anxious for the successful continuance and development of all instructive and recreative activities carried on by, and on behalf of, the staff.

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A CAROL Concert is to be given at the Queen's Hall, Langham Place, London, by the London & North Eastern Railway Musical Society. It will take place on Sunday evening, December 16, and the Society's male voice choir, full orchestra, organ, eminent soloists, and the audience, will take part. Mr. A. W. Headley, Chief Mechanical Engineer's Department, Stratford, as hon. secretary, has in hand all the arrangements.

* * *

MR. D. A. MATHESON, Deputy General Manager (for Scotland) L.M.S.R., recently presided at a concert held at Perth in aid of the National Union of Railwaymen's Orphan and Benevolent Fund. Mr. Matheson briefly addressed the meeting and said he was glad to be able to visit Perth. In Perth he started his railway work and in that city served his apprenticeship in a civil engineer's office. Referring to Perth as the Crewe of Scotland, Mr. Matheson said that although he had, of course, met representatives of the N.U.R. on many occasions, that was the first time he had presided over a N.U.R. concert. He had frequently met representatives of the N.U.R. in conference and sometimes he had been able to agree with them and sometimes he had not—but there had never been any bitterness. He felt he had always retained the confidence of the men because he realised his obligations to them. He had always taken up the position that he came, so to speak, between the board and the men, and he hoped and believed with advantage to all concerned. Mr. Matheson added that he had often met Mr. Thomas and Mr. Cramp in London, and while they had disagreed on occasions

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he numbered Mr. Thomas and Mr. Cramp among his personal friends. They were both men of great stability, and he thought both the men's and the railway companies' interests were safe in their hands. Mr. Matheson concluded with a general review of the position of the N.U.R. Orphan Fund.

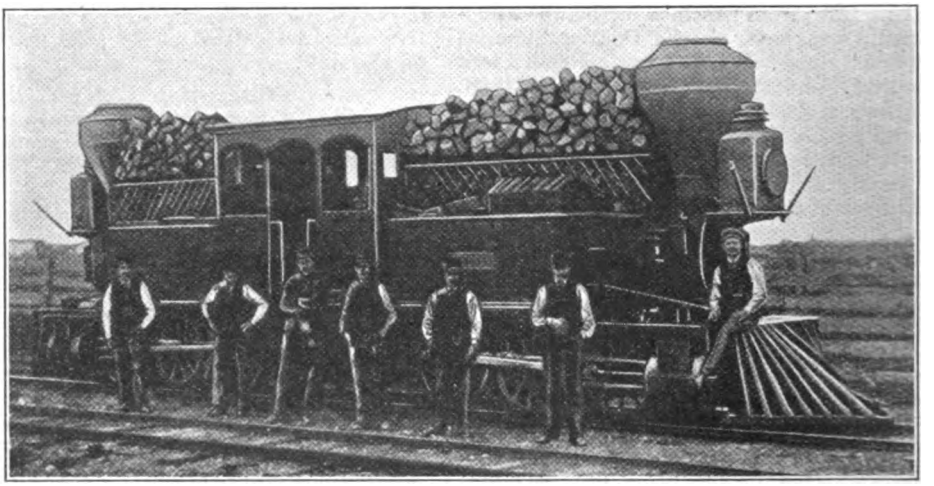
* * *

AT the War Memorial at Paddington station on Armistice Day, Sunday, November 11, a service was held, commencing at 11.50 a.m. By arrangement with the Rev. Prebendary E. N. Sharpe, M.A., Vicar of St. James' Church, Paddington, the service was conducted by his assistant curate, the Rev. J. N. E. Tredennick, M.A.

tion of the Amusements Park, past the coal mine and the Indian Pavilion to the Great Central Exhibition station, and the chief bandstand and the British Government Section, to a turning point near the Stadium. The round trip, which extends to roughly three miles, will be done in about 10 minutes. The new "road-rail" system will run from the southern side of the Amusements Park behind the Stadium to a turning point near Wembley Hill station. Thus there will be a complete connection between the two main entrances and the two main railway stations to London.

* * *

IN the passing of Charles Clarke at his Toronto home, the Canadian Pacific Railway has lost one of its oldest locomotive drivers. In the pioneer days of Canadian railroads, the late Mr. Clarke used to drive an old wood-burning engine known as a double-ender, and the engine on which he made his first run as driver on the Canadian Pacific is shown on this page. He was born in England 76 years ago and started railroading at the age of 18 with the old Midland line, joining the Canadian Pacific, from whose service he was retired, about twelve years after.



AN "OLD-TIME" CANADIAN LOCOMOTIVE.

Above is illustrated a double-ended wood-burning engine, built at Bristol, England, and imported into North America in 1872. Two were imported. One was worked on the Toronto and Nipissing Railway, and the other on the Toronto, Grey and Bruce Railway.

So vast is the area covered by the great British Empire Exhibition at Wembley that special transport facilities have had to be provided inside the grounds. There will be three kinds of mechanical transport available next April when the Exhibition opens —a "never stop" railway, the first to be installed in this country on more than an experimental stage, a "road-rail" system, and a fleet of electric cars. The "never-stop" railway is run on the principle of the Underground escalator. It does away with drivers, conductors and brakes. Its speed varies from almost zero at the stations up to 24 miles an hour in the open. This railway will start at the main (north) entrance at Wembley Park station, and will travel on an elevated road first to the Palace of Engineering, thence through the main sec-

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IN addition to current work to the value of £4,000,000, the London Midland and Scottish Railway Company intend to spend £10,000,000 on locomotives, carriages, wagons, steel rails, construction work and tools. The fact was announced recently

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by the Prime Minister by reason of its bearing upon the unemployment question. Among the works contemplated are the doubling of the line between Crewe and Weaver Junction for a distance of about 13 miles, additional loops between Manchester and Carlisle, extended siding accommodation at Camden and Willesden, the strengthening and partial reconstruction of about 30 bridges, station improvements at Tilbury Docks, Warrington, Bangor, Manchester (Victoria) and Manchester (Exchange). The early electrification of the Manchester and Oldham line is another of the works proposed, and is part of the policy for electrifying the lines in the northern suburbs of Manchester to deal more adequately with the increasing population. New steamers are also to be provided for the Continental services, and a new ferry-boat for the Tilbury-Gravesend service. Speaking generally, it is understood that this expenditure of £10,000,000 will be allocated to the extent of about £4,000,000 to the iron and steel trades, and of about £6,000,000 to the shipbuilding and other building trades.

* * *

POSTERS are exhibited at most Scottish railway stations to announce as from November 1, 1923, the discontinuance on certain sections of the London & North Eastern Railway and London Midland & Scottish Railway of making a deposit charge on season tickets (ordinary and traders'). The deposits paid on tickets issued prior to November 1 will be refunded when the tickets are surrendered on expiring. Charging a deposit on season tickets was general on the Scottish railways in pre-grouping days.

* * *

AN important conference was held at the Ministry of Transport on November 7, to consider the proposal to erect a road and rail bridge over the Severn and the Wye at Beachley. Sir Henry Maybury presided and said the estimated cost of such a bridge was two and a-half million pounds and the Great Western Railway were willing to meet half the cost. That left about one and a-quarter millions to be found by the local authorities in conjunction with the Ministry. The railway company had decided to promote a Bill which would be introduced into the House of Commons in the next Session of Parliament.

* * *

AMONG model railway owners, particularly those who possess model railways of an indoor character, the Forward Model Company, 46, Cobnor Road, Woodseats, Sheffield, has a considerable reputation as the manufacturers of wooden rolling stock. Among their specialities we notice a model railway truck with metal wheels and buffers. This truck is 5½ in. long over buffers, 2½ in. wide, and 1¾ in. in height. In addition to use on a model railway of the parlour type, these trucks may be handy to railwayists who are not model owners as trays for tobacco ash, pins, &c. The trucks being lowsided they are admirably suited for such purposes and form a distinct novelty. They cost 5s. each. The firm are makers of metal toys of various kinds and many of these may be used by indoor model railway owners to give an air of similitude to the surroundings of their lines. Thus for those who wish for distinctly British characteristics metal-made cows, sheep, fowls, and other domestic animals and birds usually seen beside a railway are provided. For those with greater ambition who wish to portray a railway such as the Uganda, which has been aptly termed "a railway through a Zoo," the firm have on sale a prime assortment of metal elephants, lions and giraffes, to say nothing of small deer. All these toys, as well as the railway models, are Sheffield made and so likewise are the metal models of objects usually seen on station platforms. For very few shillings much may be done, and interested RAILWAY MAGAZINE readers should write to the company and enclose fourpence in stamps for a catalogue and full particulars.

* * *

IN response to many applications below is given the numbers of the "Abbey" and the "Castle" classes of 4-6-0 Great Western passenger locomotives, together with the respective abbeys and castles after which they are named :—

Number of Engine.	Name of Abbey.	Number of Engine.	Name of Castle.
4063	Bath	4073	Caerphilly.
4064	Reading	4074	Caldicot.
4065	Evesham	4075	Cardiff.
4066	Malvern	4076	Carmarthen.
4067	Tintern	4077	Chepstow.
4068	Llanthony	4078	Pembroke.
4069	Westminster	4079	Pendennis.
4070	Neath	4080	Powderham.
4071	Cleeve	4081	Warwick.
4072	Tresco	4082	Windsor.

* * *

MR. C. WILLIAMS writes from Crewe :— The last of the second series of 0-8-4 shunting tank engines, viz., No. 7949, is now in traffic.

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It is painted black, thus differing from Nos. 7943 to 7948, which are painted red. All the new series will be painted black, and of these three, Nos. 7950 to 7952, will be out shortly. Two further passenger engines have been turned out in the new livery, viz., No. 2578 *Fame* (4-4-0) and No. 860 *Merrie Carlisle* (2-4-0). They have been renumbered 5309 and 5050 respectively. No. 1952 *Benbow* is the latest "Jubilee" class compound to be converted to "Renown" class (two-cylinder simple).

* * *

AMONG the exhibits at the British Empire Exhibition at Wembley Park in 1924 will be a complete working model, representing one of the stations on the Post Office Tube Railway which is to be used for parcel and letter traffic, and which will connect up Paddington Station and District Offices in the West of London and the Eastern District Offices in Whitechapel, also several intermediate Offices and Liverpool Street Station. The General Post Office have entrusted the manufacture of this model to Messrs. Bassett Lowke, Ltd., Model Engineers, Northampton.

* * *

FOLLOWING the incorporation of the Midland & South Western Junction Railway with the Great Western Railway a re-arrangement of train services at Swindon has been made that will be noted with interest by many RAILWAY MAGAZINE readers. It is no other than the restoration, on and from October 22, 1923, of a service that prevailed in 1883 and 1884 between Swindon (G.W. Main Line station) and Swindon Town (then Midland & South Western station). The service put on in 1883 and withdrawn at the end of 1884 was :—

	WEEK-DAYS.	SUNDAYS.
Swindon (G.W.) to Swindon Town	7 trips.	1 trip.
Swindon Town to Swindon (G.W.)	6 trips Mondays to Fridays; 7 trips on Saturdays.	2 trips.

* * *

ON the visit by the Prince of Wales to Winchester on November 7, the Southern Railway Royal Train from Waterloo consisted of a set of new corridor stock hauled by a 4-6-0 locomotive of the "736" class. The return journey, arriving Waterloo 6.51 p.m., was in charge of No. 754 of the same class. There were no decorations.

* * *

MR. M. A. BARI, who during the past summer, on behalf of the Indian Government, has been investigating railway transportation and track conditions in the United States of America and Canada, has returned to India converted to the advantages of private over state ownership. Speaking before he left Canada, Mr. Bari remarked: "After I completed my tour in the United States, I came to Canada, and if I had met with surprises in the United States at the thoroughness of railway management, I positively was amazed at the superb organization and management of the Canadian Pacific Railroad and its auxiliary features of steamship and hotel activities. It is marvellous when you consider a railroad crossing an entire continent from the Atlantic to the Pacific oceans. Connection in the Atlantic in touch with England and the whole of Western Europe, sucking in the business to Canada from Great Britain and other European countries, while on the Pacific its steamships connect with the Orient. What struck me most in looking into the operation and management of the Canadian Pacific was the perfect organisation, the co-operation in management, not only by the chief officials and the departments, but the co-operation and co-ordination of all the company's employees from the head official to the humblest workman. It seems to me that every man connected with the Canadian Pacific Railway takes the same interest in the company and its railway steamships and hotel system management as if he were in fact one of the owners. I carry with me to India for practical recommendation an emulation of the Canadian Pacific Railway Company's system."

* * *

0-6-0 locomotive No. 686 S.E. & C. section of the Southern Railway is now running painted black, picked out with green lines, and bearing on the tender sides in big block characters of buff colour the following :—

SOUTHERN
686.

* * *

IN connection with the withdrawal of the 2nd class coaches on the S.E. & C. section of the Southern Railway, to re-letter them 3rd class, advantage has been taken to repaint the coaches the standard green of the Southern Railway, and to letter them "Southern Railway." An appreciable percentage of the S.E. & C. section rolling stock has already been so treated.

* * *

SIR WILLIAM F. COATES, Bart., President, Belfast Chamber of Commerce, writes :—In the interests of the commerce of England and Northern Ireland, and in particular of Belfast, the greatest distributing port in all Ireland, I should like to point out that the following direct steamship services exist between

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England and Belfast and Londonderry: London-Belfast, Liverpool-Belfast, Fleetwood-Belfast, Heysham-Belfast, London-Belfast via Stranraer and Larne, Liverpool-Londonderry, Heysham-Londonderry. May I also observe that merchandise consigned via Belfast can be easily and safely distributed to all parts of Northern Ireland. Trading conditions in Northern Ireland, viz.: in the counties of Antrim, Down, Londonderry, Armagh, Tyrone and Fermanagh, are happily normal; between Great Britain and Northern Ireland, trade continues to be conducted in absolute freedom, without risk, and without the complications and annoyances attendant upon Customs barriers.

Indicators." These indicators are worked from a time limit device, which operates as soon as the lift has stayed at the top or bottom landing for a predetermined number of seconds, thus giving the signal to passengers and liftmen that the lift has stayed its allotted time at the landing and is to start. These lift hustlers are now in operation at 17 Underground stations, and other stations will be similarly equipped in the near future. Under the new reconstruction programme it is proposed to introduce escalators at most of these busy centres.

* * *

On November 5, in the forecourt of Golders Green Station, film pictures were

Photo.] NEW ZEALAND RAILWAYS. [*W. W. Stewart.*

"Mercer Goods" on Christmas Day, 1922.

On November 5, the Elephant and Castle station, on the Southern Railway, was the scene of a serious outbreak of fire. Nos. 1 and 2 suburban platforms were destroyed. The main line platforms were not affected by the fire, and after a suspension of an hour and a-half the train services through the station were resumed.

* * *

At Piccadilly Circus, Leicester Square, Oxford Circus, Bond Street and other important shopping centres, the London Tube railways have introduced a scheme of landing control to provide a speedier lift service, and reduce to a minimum the irksome waiting about for lifts. This has been effected by the introduction of "Audible Interval

shown relating to the extension of the line from Golders Green to Hendon. The series had been specially prepared by the London Underground Railways. The London General Omnibus Company's well-known travelling daylight cinematograph theatre (which is composed of a 'bus chassis fitted with a dynamo, a screen and a projector room) was employed, and the exhibition was witnessed by a large number of onlookers. The film was in two parts, the first dealing with the early days of underground travelling and the important part then played by the City & South London Railway, while the second dealt more particularly with the actual construction of the Hendon extension (which was formally opened for traffic on November 19) from the cutting of the first

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sod by Sir Philip Lloyd-Greame, in June, 1922, to the present day.

* * *

Two new stations at North Acton and West Acton on the Ealing Extension of the Central London Railway were opened for traffic on November 5. These afford facilities to Acton with its population of 50,000 and particularly to those living in the residential areas which have sprung up since the extension line from Wood Lane to Ealing Broadway opened in August, 1920. The site of the West Acton station is in Twyford Avenue, where considerable building operations are now in progress. North Acton station, in Horn Lane, is an exchange station with the G.W.R., and links up the districts of Wycombe and Greenford with the Underground system.

* * *

THE Southern Railway announces the Northern of France Company's train "Rapide" No. 18, running from Calais to Paris in connection with the 11.0 a.m. service from Victoria, is now strictly limited. Passengers for Paris, and destinations beyond Paris, intending to travel by this service are therefore advised to book their seats in the French train as long in advance as possible. Passengers failing to reserve seats in this limited train should arrange to travel by one of the alternative Paris services leaving London at 9.15 a.m., 10.0 a.m., 2.0 p.m., or 4.30 p.m., or by the night mail services via Dieppe or Havre.

* * *

A COMPLETE reconstruction of the Priory station, Dover, and other improvements of the railway property there is proposed by the Southern Railway. Sir Herbert Walker and other officers lately visited Dover to discuss the proposals with the Corporation, who desire to improve the Folkestone Road concurrently with the rebuilding of the Priory station.

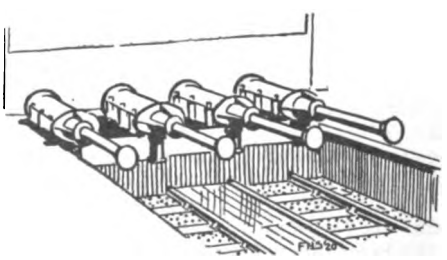
MR. J. F. GAIRNS had a large and appreciative audience at the Town Hall, Leyton, on November 8, when he lectured on "Construction, Operation and Maintenance of Locomotives," to the Leyton Engineering Trade School Engineering Society. The lecture was illustrated by 70 lantern slides.

* * *

AT the November general meeting of the Railway Club, 65, Belgrave Road, S.W.1, a lecture was given by Mr. F. W. Galton, the Secretary of the Railway Nationalisation Society. Mr. Galton presented the case for railway nationalisation in some detail and drew attention to many phases of railway organisation and working which he considered would be better controlled by a system of unification and public ownership. A discussion followed, and Mr. W. J. Bassett-Lowke strongly supported the lecturer, but opposite views were expressed by Messrs. Browne, Bardsley, Ffitch, and others. A vote of thanks proposed by Mr. L. H. Bailey, and seconded by Mr. C. L. Cleaver, was carried with great cordiality. At the next monthly meeting on Friday evening, December 7, Mr. Cecil J. Allen will give a lantern lecture, his subject being "The Manufacture of Iron and Steel for Railways." On the following Friday, December 14, the same gentleman, in his capacity as president of the club, will take the chair at the annual dinner, which is to take place at the Feathers Hotel, Broadway, Westminster, S.W.1, at 7 p.m.

* * *

To the railwayman, and to the RAILWAY MAGAZINE reader who indulges in "clocking" trains, an absolutely reliable watch is a first necessity, and such people are catered for by Mr. R. M. Mercer, 29, Warwick Row, Coventry, who is a specialist in railway watchmaking. He has a great reputation in the railway world as a watch renovator, and gives a twelve months' guarantee with every watch repaired.



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